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Roadways, Railways, and Waterways.

AMONG the latest developments of mechanical theory is the general solution of the machine problem proposed by Professor Reuleaux. This is dependent on the proposition that the machine, from a kinematic point of view, must be divided into pairs of elements intead of into distinct elements. A large and learned volume, entitled "The Kinematics of Machinery," in which the principle has been carried out, has already engaged our attention more than a year ago.

There is a corollary which may be derived from the doctrine of the kinematic pair which has not yet received specific attention. It is possible that very important results may spring from its consideration and demonstration. It is this. As the elements of any machine, or complex system of machinery, are to be reduced to pairs, from a mechanical point of view, so may they be considered as pairs from an economical point of view; and the question will then arise, how far are we likely to arrive at definite results, which shall combine all the certitude of science with all the utility of practice, by the formal consideration of the economic pair of elements, in the same manner that Professor Reuleaux has taught us to consider the kinematic pair of elements?

The case to which attention should first be directed in this novel inquiry is one of primary social and industrial importance. It is that of the transport of bodies from place to place. The rapidity of the growth of our scientific industry is shown by the fact that this phrase no longer comprehends, as it did at the commencement of the century, the whole question of communication. Messages are not bodies. The necessity which formerly existed for the transmission of a written document is no longer absolute. The words of a speaker can be intimated at almost or quite the rapidity with which they are spoken, by a series of larger or shorter flashes, of louder or softer ticks, or dots and dashes, at any distance within the range of the electric telegraph. Nay, the far more wonderful discovery of the telephone,—which was deferred rather than hastened by the experiments with the magnetic needle, — promises to render distance a very surmountable obstacle to the most intimate and unmistakable conversation.

Omitting, then, for the present, as a separate branch of inquiry, the subject of the transmission of thought, whether by signs or by sounds, it is proposed to regard the question of the economical aspect of the elementary pair or pairs which form the machinery for the transport of bodies. Such is the general problem. The most important cases for consideration will be those of the transport of the human body itself (or passenger traffic) and of the transport of goods or merchandise. Minor divisions, no doubt, exist, but their consideration may, for the present, be postponed.

We pass over the primary question of automatic or self-contained power. The admirable mechanism by which the man walks, or the horse trots, and even trots with the man on his back, is a subject for the physiologist, rather than for the engineer, to discuss. Our present business is with machines made by man; not with the mechanical functions of the human or of the animal body, although it is to the exercise of these functions that the measurement of the force of machines is even to the present time referred. We still use the conventional unit of the horse power in speaking of a machine; though we have to specify whether that horse power be nominal, indicated, or delivered. We start, then, with the machine.

The economic pairs of elements which form the foundation of machinery for transport are primarily three, according to the fact whether the transport is to be effected by air, by water, or by land. The consideration of the first pair, by the use of which the aëronaut attempts to emulate the bird, we at present omit. In water and in land transport, four distinct cases demand attention. These are, first, transport by sea. Second, inland transport by river or canal. Third, land carriage by horse power. Fourth, land carriage over an artificially prepared metal surface, either by horse power or by mechanism.

Whichever of these four pairs of elements we consider, we shall find that a certain natural limit is imposed both on the weights to be transported, and on the speed at which that transport is to be effected. These questions of weight and of speed are, indeed, secondary; but they are, nevertheless, of extreme importance. The present question is the economic cost of each element of each pair.

Let us commence with ocean traffic. Here the fixed element, over which the mobile element is propelled, is provided by nature. It exists, in certain localities, without need of preparation or of maintenance. Economically regarded, it is afforded absolutely without cost. It may, however, simplify the inquiry to regard port and harbour dues, or any costs attendant on embarking and disembarking, as those of the watery road. For a long voyage these costs will be almost infinitesimally small. For a coasting voyage from port to port, along a well-lighted shore, they may prove considerable. But if they tell upon net earnings, they in no way involve outlay of capital on the part of the transporter. His whole outlay is concentrated upon the mobile element of the pair. His capital is invested in the construction of vessels, and his yearly payments are devoted, mainly, to their maintenance and propulsion.

It is thus evident that a very great advantage is secured to the transporter by sea, from the fact that a fixed element, capable of resisting any strain that may be brought to bear on it, and offering the minimum amount of friction to the moving element, is provided for him gratuitously. His whole expenditure can thus be concentrated on the provision of the moveable element of the pair, and in the impartation of motion. As to this, indeed, he is also provided with a motive power that costs him nothing. It is, however, objectionable, on the ground of its incertitude. From the time that the first canoe was launched on the sea, by neolithic, or perhaps by palæolithic mariners, down to the revolution effected by the discovery of Watt, the mariner had depended on the gratuitous but uncertain service of the wind as a propelling power. When it became evident, somewhat slowly, that the mechanical power of heat was applicable to the propulsion of ships, the great object first sought by the naval engineer was to use steam as an auxiliary to sails, and to take advantage of the ready service of the wind whenever it blew. This idea has been only recently discarded. It is, however, the latest decision of the naval architect that auxiliary steam power is a mistake. The *gratis* service of the wind involves a cost greater than that of coal—the cost of time. The navy of the future will be mechanically propelled; and sailing vessels will remain only in the possession of the yacht club or other non-commercial owners.

The shipowner, then, provided with the immovable element of his machine pair gratis, and provided with a motive power which is better worth applying than the gratuitous service of the wind, is to a great extent unrivalled as a carrier. If shipowners were a united body, and arranged for the division of business without mutual competition, the rate of freight would be fixed at the figures that would bring the largest returns, taking into consideration quantity, as well as price, of transport. As it is, the rates are subject to mischievous fluctuations. The freight of corn from Calcutta, which last year was quoted at 70s., is to-day quoted at 20s. In July, 1876, the freights from the Danube to England fell to 4s. 6d. per quarter, which is less than 1-12th of a penny per ton per mile. If vessels could be found to charter at this rate, as was actually the case, the profit made when, as in the following November, freight reached 9s. 3d. per quarter, must have been considerable. No *data* have been as yet collected to show the comparison of the constructive cost, and of the earning per annum, of a given class of vessel per ton. But it is said not to be unexampled that a vessel should earn its own cost by its gross freight within a year. This may be considered as the outside benefit which normally can be derived from the utilisation of a single element of the economic pair. If in this case the working cost be half the gross returns, we may perhaps consider that we have the most favourable instance of transport, viewed from the economical standpoint.

In the second case of water-carriage, that of internal communication, a cost attends on the provision of the fixed element of the pair. In the most favourable case, that of navigable rivers, this cost is low. The average cost per mile of the 4,138 miles of internal navigation in England, for construction or putting in navigable order, was 3,335*l.* The expense of the Birmingham Canal,—one of the most lucrative ever made,—did not amount to double this cost. Allowing 7 per cent. for interest and depreciation, the annual charge, in the latter case, for the fixed element of the pair is only 420*l.* per mile. The original 1,000*l.* shares in this canal were divided into thirty-two parts, each of which, in the year 1865, was saleable at about 948*l.*, paying 4 per cent. on that price. The tonnage on that canal, in 1868, was 6,982,773 tons: the impost of 0·0014d. per ton per mile would therefore pay the cost of the fixed element of the pair. At the other end of the scale, the Suez Canal, which has cost 70,000*l.* per mile for works alone, has been raised to the large paper cost of 162,000*l.* per mile by the financing adopted in order to float the undertaking. This cost is for the fixed element of the pair alone. The moveable element, both in capital and expenditure, is provided by the owners of vessels who use the canal. In this case the charge of ten centimes per ton per mile is cheerfully paid, in order to effect a saving of some six or eight weeks of voyage. The value of the saving of time as an element of income is thus most signally illustrated.

The propulsion on canals is yet in a state of infancy. Horse-power is for the most part used. The remarkable results of the application of speed to fly-boats on canals, according to the experiments of Fairbairn, have been neglected in consequence of the attention concentrated on railways, where a much higher speed was attainable with certitude. The cost of horse-towage on the English canals has been estimated at 0·35d. per ton per mile. In France it has been reduced to 0·27d.; at which price steam screw tugs have been employed in England. Boats with engines on board have reduced the cost of propulsion to 0·20d. per ton per mile. On the Aire and Calder navigation the cost of steam haulage up and down the stream is as low as one-eighth and one-tenth of a penny per ton per mile. The cost of vehicle is lower, per ton, in canal boats than in any other means of transport. With ample traffic, and economical working, canals, as presenting the cheapest form of both the fixed and the moveable elements of the machines, are at this moment in some instances the best paying modes of transport. It may be confidently expected that they will again play a considerable part in internal traffic, as the scientific appreciation of the value of this pair of elements is very highly in their favour. The causes which have strangled the traffic of most of the English canals have not been either mechanical or (properly speaking) economical.

The third pair of elements to be considered is afforded by the conduct of vehicles drawn by horses over an ordinary road. An element of cost here comes in which is unfelt in ocean traffic, and which is not always very perceptible in canal traffic. This is the overcoming the natural elevations of the country. In canals this is now for the most part effected by locks, and, when water is plentiful, loss of time is the chief objection. On roads, the limit of horse-power is soon attained, when the hills to be surmounted are steep. The cost of the fixed element in this mechanical pair is due first to the effort to diminish or equalise the resistance of gravity, which is effected by grading the road, involving more or less earthwork and masonry; and secondly, to the effort to diminish the running friction, and to equalise it as between summer and winter; which is effected by paving or metalling the roads, so as to present a hard level surface to the wheels of the vehicles and for the feet of the horses. The cost of the roads now constructing in India varies from 1,500*l.* per mile where the works are light and labour is abundant, to 2,700*l.* per mile where the works are heavy and labour scarce. This is for construction alone. About 300*l.* per mile has to be added for metalling; the width of the road, exclusive of side paths and fences, being 16 ft.

For the maintenance of a macadamised road the cost in the metropolitan district amounts to 250*l.* per mile, equivalent to 2s. 10d. per square yard, per annum. A minimum cost is that of the highways in Sunderland, which does not exceed 25*l.* per mile per annum. Both original cost and (and that in a higher degree) annual outlay, must be regarded as functions of the traffic. In some of the London streets this may be considered to have attained the maximum, at least for the hours of daylight. For the best wood pavement the first cost of laying is 18s. per yard. The highest annual cost of maintenance returned is in Lothbury, where for twelve years it has averaged 3s. 4d. per square yard. A 30-ft. carriage-way, accommodating four lines of vehicles, will thus cost for maintenance, in an extreme case, 2,933*l.* per annum, exclusive of the interest on the sum spent in grading the road.

In regarding the modes of transport in the abstract, we thus see that a cost which is proportionate to the wear and tear caused by the traffic, and which rises to a considerable sum for a constant traffic, is necessary for the permanent element of the paved or metallic road. It should, however, be borne in mind that this cost is rather matter of public necessity than of commercial import. We have now no instances of roads made and maintained by contractors, or private individuals, as paying speculations. To some extent, therefore, the traffic that makes use of the public highways holds a similar position to the ocean traffic. In that, the stationary element is provided free of charge by nature. For ordinary road traffic it is provided, free of direct charge to the users, by the State.

The second part of the expenditure on this mode of transport, that of the cost of the provision and impelling of the movable element of the pair, varies according to the character of the traffic, and according to the speed. We may take as a case of average condition that of the London General Omnibus Company. In this instance the gross annual receipts are equal to 125 per cent. of the cost of the moving stock, in vehicles and horses. The dead weight moved is almost exactly double the net or paying weight. The cost of carriage per ton-mile gross is 3·8d. per mile. The amount of capital invested by the company is so small as to afford a fair dividend at a moderate rate of profit on the yearly outlay; and the gross revenue amounts to a charge of but little more than 4d. per ton-mile gross of passengers and vehicles. We have here an instance that is very favourable as far as the free provision of the fixed element, and the comparative low cost of the movable element is concerned. Propulsion is costly; but the small amount of margin required for profit renders the enterprise sound and remunerative under able and honest management. With increased speed of transit the cost per ton-mile gross will increase, as with reduction of speed it will diminish. Further data as to the extremes are desirable.

In the fourth of the cases which we have proposed to examine, the effort has been made, first, to diminish running friction; and, secondly, to increase velocity, by means of mechanical propulsion. For this end, the immovable element of the kinematic pair has to be provided by the carrier, as well as the movable element and the working cost. In the first instance, at Killingworth, the saving of friction was the main object proposed. In the earliest and rudest efforts this class of resistance was reduced by from 50 to 75 per cent. by the introduction of an iron bearing surface for the wheel tracks. In the later perfection of the railway, the running friction is reduced from 45 lb. per ton, which is that offered by a road in good order, to 7 lb. or 8 lb. per ton; or to one-sixth of the most favourable case of ordinary road. This saving, however, does not represent an equal saving in cost, except in the case of an absolutely level road. The resistance offered by gravity increases in exact proportion to the incline to be surmounted. It has been the rule of the most thoughtful engineers so to lay out their roads that the force of gravity should equal the resistance of running friction on a descending gradient; so that this resistance on a level would not be more than doubled on the ascent. Thus Sir J. Macneil graded his mail-coach roads at 1 in 50; and Mr. Stephenson laid down the ruling gradient of 1 in 330 for the London and Birmingham Railway.

The cost, however, at which the fixed element of the kinematic pair is thus provided is very heavy, and it is a cost which falls entirely on the carriers. With the general decline in the net earnings of railways that has of late years been the rule, the companies have ceased to give more information than has been dragged from them by law. It is thus necessarily difficult to distinguish the cost of the paid and of the mobile element in the railway system. In the United States of North America the cost of the two elements together is under 12,500*l.* per mile. In the United Kingdom it is 39,000*l.* per mile. In England alone it rises to an average of 45,444*l.* per mile. On the Metropolitan District Railway it has risen to the enormous price of 683,866*l.* per mile. In this last instance the cost of the movable element is one-fortieth of that of the fixed element. On the chief passenger-lines the cost of the moveable element rises from 2·5 to 7·86 per cent. of the total outlay, according to the increase in the heavy traffic. On the trunk lines with heavy mineral traffic, the cost of the movable element rises from 9·16 to 16·92 per cent. of the total cost. In the last instance, that of the North-Eastern Railway, the total cost per mile is 37,078*l.*, of which 6,320*l.* is the cost of the movable, and 30,758*l.* that of the fixed element. On the Brighton, the cost of the former is 4,230*l.*; that of the latter, 61,755*l.* per mile. The gross income of the North-Eastern Railway, in 1876, was 4,429*l.* per mile per annum; that of the Brighton was 4,954*l.* per mile. The cost of the fixed element depends mainly on the physical features of the country, unless the amount of traffic be so great as to require additional lines of rail. In the cases we have cited the gross earnings are not so different in amount as to complicate the question; but the character of the traffic varies fundamentally. The North-Eastern derives 37 per cent. of its income from the transport of minerals. The Brighton derives only 7 per cent. of its income from that service. The annual gross earnings of the latter are equal to 115 per cent. of the cost of the moveable element; those of the former are only equal to 70 per cent. of that cost. If we separate the accidental from the essential features of the case, and regard the cost of the fixed element, as before said, as dependent on the character of the country, we find how much better adapted is this mode of transport, economically considered, for passenger than for heavy traffic. In fact, on the metropolitan lines a movable element, costing 18,000*l.* per mile, earns an annual gross income of 36,000*l.* per mile, a procedure which is the most lucrative to be met with under any conditions. The high cost of the fixed element, however,—605,600*l.* per mile,—is such as to reduce this high rate of margin to an ordinary return.

The cost of propulsion per ton-mile gross under this arrangement of elements is not directly ascertainable on the English railways. The most cheaply worked railway in the world is the East Indian. On that, the cost of running a ton of loaded train for a mile, including all expenses, is only 0·172d. On the average of the India guaranteed lines, the cost is 0·260d. On that of the chief French lines it is 0·254d. In America it rose (in 1873) to 0·50d. In New South Wales to 0·558d. On the Metropolitan Railway the cost has been calculated at 0·437d.; but this is enormously augmented by the frequent stoppings and startings at high speed. It follows that the cost of carrying a ton of loaded train on a railway varies from 0·17d. to 0·56d. per mile. From the saving thus effected, as compared to the 4d. per mile of the road traffic, is derived the means of paying interest on the large sums laid out in providing the fixed element of the kinematic pair of the railway system.

It is, however, perfectly clear that the advantage thus secured applies chiefly, if not entirely, to passenger and light merchandise traffic. The extreme case of the East Indian Railway, where coal costs only 5s. per ton, and where labour is one-twelfth the price current in England, does not give a lower cost of transport than that of sea-borne freight from the Danube, or of river and canal borne freight on the Aire and Calder Canal. It is about the same cost as that of the sea-borne freight of coals from Sunderland or Newcastle to London. But in the case of the East Indian Railway provision has to be made for recouping the cost of above 20,000*l.* per mile for the way and works. In the case of the three great lines which compete with one another and with the sea for the privilege of bringing coal to London, the fixed element has cost 42,626*l.*, 46,561*l.*, and 47,784*l.* per mile respectively. The further investigation of the problem stated by M. Reuleaux, therefore, is full of instruction for those who have money to invest in industrial enterprise.

THE NATURAL HISTORY MUSEUM AT SOUTH KENSINGTON.

A CONSIDERABLE number of the members of the Architectural Conference assembled on Thursday, the 6th inst., to go over Mr. Waterhouse's large building under the direction of its architect. On the face of it the special interest of the building lies in the fact that it is the largest experiment yet made in terra-cotta building, or more strictly terra-cotta design, for the material has little to do with the construction, and is mostly only a facing. The visitors, however, were first invited to look at the plans and hear a few words from Mr. Waterhouse in regard to the history of the building, which is probably remembered by a good many of our readers. The late Captain Fowke had made plans which probably had high merit of their own, but on investigation proved incapable of being worked into any arrangement satisfactory to the views of the British Museum authorities, who had, of course, a considerable voice in the matter, as the real object of the building is to form a "chapel of ease" to the great Bloomsbury establishment, and by taking the Natural History portion of its stores to leave the original building free to be entirely devoted to antiquities. Mr. Waterhouse is so complete a master of planning that it will surprise no one to hear that his plan for the building was in its original form exceptionally good and suitable, and it will not surprise many to hear that its best and most characteristic feature was spoiled by official interference, as that is the way we do things in England. The plan provided for the stuffed and preserved animals representing living species in one of the front wings, and for the geological or rather palæontological remains of extinct species in the other wing; and this arrangement is nearly kept to in the actual building. But the original plan provided that in the one-story galleries which run back at right angles to the front block, and which are set apart for the smaller classes of objects contained in cases, there should be between the public galleries a parallel series of semi-private narrower galleries or corridors for the use of scientific students, and that the cases should be so placed as to open upon both, but with the side towards the public gallery hermetically closed with fixed glass, while the sides or backs of the cases towards the scientific students' corridor should be arranged so as to be easily opened for the better and closer inspection of the objects by those who had special reasons for studying them. This was an admirable example of the thoughtful arranging of a plan with the object of rendering it as useful as possible for its purpose, or rather of fitting it to two separate purposes; but the British Museum would have none of it, on the ground that they cared nothing for scientific students, and that the exhibition was for the unscientific public, who were to be the first object of consideration, and therefore it was ruled that the cases must be placed so that the British public could circulate all round them. It does not appear that the original plan would have placed any obstacle in the way of inspection of the contents by the general public, while it would have provided special convenience and facilities for persons whose aims were beyond mere amusement, and who would be specially glad of quiet and seclusion for carrying on their investigations; and though Mr. Waterhouse made no complaint against the Museum authorities, we certainly do complain, and think that a rather stupid thing has been done, and a good plan spoiled.

In regard to the purely architectural part of the subject, the general effect of the building is very satisfactory, and in some points much more than satisfactory. In regard to some parts of the front elevation, we have doubtful feelings; the dormers along the roof-line are a little heavy in design and outline, and considering this, and that the building is in general characterised by a massive style of detail, founded on the Romanesque more than on any other previous style, we cannot help thinking the ground story deficient in mass and solidity for the superstructure. This story, however, eventually will not be much seen from the road, if, as we understand, and regret to hear, a wall is to take the place of the present light open railing. Access to the building from the Cromwell-road will be obtained for carriages by two inclined planes sweeping round in a curve from each extremity of the ground to meet in front of the centre doorway; the platform opposite the doorway extends into two projecting bastions, between which comes the flight of steps up to the doorway for foot-passengers. The central entrance, with its deeply-recessed great archway, with richly ornamented terra-cotta shafts and archivolts, and bas-reliefs in the same material in the space over the doorway, has a very fine and rich effect indeed, heightened still more by the agreeable warm tone of the material. Passing through this door, we come through the vestibule into the centre hall, a great oblong apartment, the length of which is at right angles to the principal front. We made some comments, chiefly laudatory, on this interior *apropos* of the drawing of it in the architectural room at the Academy; the points which we then thought open to criticism we still think so, but the beauties of the architecture come out better in reality than in the drawings. There is a general look of mass and solidity about the whole which is truly architectural; and the recesses in the side on the ground floor, between the main piers and roof-shafts, add very much to the *ensemble* by their effect of shadow. These bays or recesses have a practical value in providing for the arrangement and grouping of objects with a special light from the back of each recess; they also were objected to by the Museum authorities at first, on the ground that there was a difficulty in getting the whole hall sufficiently under the eye of the attendants and keepers, who would have to be continually moving about to see that no mischief was nefariously done in these recesses. There is reason in this objection, but it was overruled in favour of the advantages of lighting and arrangement presented. At the further end of the hall from the entrance is the main staircase to the first floor,—hardly yet commenced, however. On reaching the top of this staircase, on either side of the hall we return towards the front of the building along arcaded corridors over the ceilings of the recesses before mentioned, and then further ascend to the level of the first-floor of the front building on a wide staircase which is carried on a flying archway over the hall, beneath which we had passed on entering. The look of this great arch, and the stair and balustrading surmounting it, is very fine from the upper end of the hall; it makes quite an unusual feature in a grand palatial style. Over the staircase the roof-shafts carry solid arches in brick and terra-cotta supporting this portion of the centre roof, and which look so well and so architecturally solid and monumental as to make us the more regret that this mode of carrying the roof should not have been employed in the other bays of the hall instead of the iron principals, which, as we noticed in speaking of the drawing aforesaid, look far too light to go well with the substructure from which they spring. The piers which flank this flying staircase have a kind of tree-stem ornament up the angles, up which climb terra-cotta monkeys in various attitudes, modelled with a good deal of spirit and vivacity. The apartments forming the first floor in the front block of building (and to which the corresponding rooms on the ground floor are nearly similar), present each a long room divided into three aisles by piers apparently of terra-cotta, which, however, is only an outside casing to the iron standards which are the real supports of the floors above. The result is pleasing to the eye, but not quite satisfactory to the judgment. The apparent terra-cotta piers entirely conceal the support, and hardly look as if they could carry anything themselves, and yet seem too good and solid a material to be a mere facing. The design of these piers is certainly novel and pretty. They are oblong in plan, the longer side parallel with the length of the room, and consist of a kind of pedestal about three-fourths the height of the room, the remaining portion breaking into four pilasters square on plan, and with foliage ornament on the outer faces and the capitals: the "pedestals" in the particular room in which the visitors first met (and which we believe is to be devoted to marine fossils), are decorated in a very pretty and piquant manner by very low reliefs of fish and other aquatic creations, worked on various blocks here and there in an accidental sort of manner, and as if from the inspiration of the moment in working the material, the general face of which is relieved also by waving lines symbolical of water, with an ornament of conventionalised aquatic plants delicately modelled in very low relief just above the plinths. The effect of this treatment is very refined and unusual, and gives a picturesque interest to what would otherwise be surfaces of bare jointed terra-cotta: we presume the other rooms which follow the same general design are similarly treated, in character with the objects for which they are intended. The only thing in the terra-cotta work we do not quite like in these rooms is the little arcade under the ceiling, which seems out of keeping in scale and architectural style with the rest of the detail, and, moreover, takes away the appearance of abutment from the segmental drop arches over the windows, which just range with these little arcades. In this room was shown a small section of the terra-cotta facing and brick backing of the main walls, put together on the floor, to show the manner of bonding of the terra-cotta into the brickwork. Every other block in a course of terra-cotta is made as a kind of large hollow brick, going far enough into the wall to have half-a-brick bed in addition to the average thickness of the terra-cotta slabs; the blocks between these, with the same face externally, are only thin slabs (about 1½-in.) with no bond, of course, into the brickwork, but retained securely in their places by a rebated edge fitting to a corresponding rebate in the hollow block on either side. These hollow blocks are filled up internally with concrete before being set in their places. The method of setting and trying the piers surmounting the iron standards was also illustrated; in this work slate dowels are employed to facilitate the true building up of the pier in the first instance. It was mentioned as a *raison d'être* for these terra-cotta casings, that they served to render the construction more fireproof by covering up the iron,—quite a sufficient reason, if they will really achieve that object, which, however, we should think would require that the spaces between the terra-cotta and the iron should be filled up solid with fine concrete. There is a great deal more ornament about the building than we have space now to describe; panels everywhere adorned with busts and designs of animal life, in a style very well combining spirit and character with sufficient conventionalism. The plaster ceilings to the main rooms and corridors we regretted rather: the material, or something like it, is necessary for the sake of light, but the panel designs in which it is worked are not interesting, and (again) seem out of keeping with the main feeling of the architecture.

But taking the building as a whole, its architect is to be congratulated on having produced a remarkable work, eminently suited to its intended purpose, and presenting, in the interior especially, unusual architectural interest both of *ensemble* and detail, and forming a very fine illustration of what can be done with terra-cotta as a material for architectural embellishment on a great scale.

PRESERVATION OF FINE INDIAN BUILDINGS, AND INSTRUCTION IN INDIAN ARCHITECTURE.

WE have reason to believe that a Resolution has been forwarded by the Viceroy of India to the Secretary of State for confirmation, which will declare that,—"The preservation of ancient monuments of historical or archæological interest is an essential duty of every civilised Government. The Government of India has received from its predecessors an inheritance of such monuments which, for variety, extent, completeness, and beauty is perhaps unequalled, but certainly unsurpassed, throughout the world. So vast, indeed, has been this inheritance that the full magnitude of it can only be gradually ascertained: but a few years ago the first authorities on the subject were of opinion that only one-half of the remains known to exist had been explored; while the result of the recent excavations at Gandhara and Bharhut indicates the value and variety of the sculpture, the art-treasures, and the pictures of social life in ancient days, which further research is likely to recover from the numberless buried cities of this empire."

We understand that the Government of India will be prepared to guarantee to each of the local Governments a minimum annual contribution in aid of local resources, the amount of which will be fixed for five years, and subject to revision at the end of each such period, and will look to these Governments to provide from other sources the rest of the funds which may from time to time be necessary for the preservation of their ancient monuments. It will also recommend the appointment of an officer to superintend the preservation of ancient monuments and to collect and diffuse information as to ancient

systems of Indian architecture, their materials, and methods of construction.

This resolution is founded on a minute prepared at the end of last year, by Sir Andrew Clarke, minister of Public Works in India (formerly director of works of the Navy), which is sufficiently interesting to be made public. We print it in full:—

Reverting to my note of the 1st of February last, I now submit, for the final approval of his Excellency, the following review and proposals:—

1. An application was made on the 22nd September, 1875, for an annual grant of Rs. 35,000 from imperial funds, for the preservation of works of antiquity and art in the North-western Provinces. It was at first agreed to sanction this sum for a term of five years, but the financial department in March, 1876, limited the grant to one year, and left its continuance dependent upon the state of the finances. The Government of the North-western Provinces in December, 1876, then announced having set apart Rs. 551,259 from local funds for the purpose, and when this sum is expended, it is for us to decide if the necessary cost of completing the work can be afforded or not. When the latter announcement came before us, I deprecated accepting any responsibility for finding the balance of expenditure, on the grounds of other more urgent wants being neglected, but I was far from desiring to depreciate the importance of keeping the fine monuments of this country in repair. In February last I recorded my opinion that the grant-in-aid for five years should be restored. In fact, when the original proposals were made in 1875, I advocated an imperial service, and I most strongly agree with the opinion expressed by the Viceroy in his minute of January last, in which he says:—

"The preservation of the national antiquities and works of art ought not to be left exclusively to the charge of local Governments, which may not be always alive to the importance of such a duty. Lieutenant-governors who combine æsthetic culture with administrative energy are not likely to be very common, and I cannot conceive of any claims upon the administrative, initiative, and financial resources of the supreme Government, more essentially *imperial* than this one."

2. The Public Works Department has been accused of acts of barbarity in regard to old buildings, and in now accepting the responsibility that lies upon it of keeping these monuments in repair I seek to remove a reproach which has in it more or less of truth, by proposing a systematic imperial survey of architectural buildings in India, which should have for its aim:—

First, to be in concert with the Director-General of Archæology and various local Governments and administrations in regard to the preservation * of buildings.

Second, to provide the means for producing a standard work on Indian architecture,† for use in the engineering colleges and schools of this country, as well as in the Public Works Department.

The arguments for attaining these objects by an imperial service are that local efforts and interest for preservation are spasmodic, and buildings are left to be repaired or to go to ruin, according to the interest taken by governor, lieutenant-governor, or chief commissioner. A general supervision can alone detect what it is of the first importance to *preserve* amongst all the thousands of Indian monuments. As regards architecture, native styles do not belong to particular administrative areas, and can only be examined from a broad and imperial point of view. The best monument in a province may not be the best type of a particular style for the whole of India, and to make elaborate records of everything locally interesting would, for architectural purposes, be an extravagant and useless process.

3. Before making definite proposals, it will be useful to state briefly what has been done:—

Although much has been written at various times on Indian architecture, there exists no one work which deals in detail with its varied forms in the same way that Classical and Gothic architecture has been described by writers whose works are now standard authorities. It is true that Ram Raz, a Hindu, endeavoured many years ago to write a treatise * on the rules of native architecture, but it is merely a collection of fragments from a variety of ancient works, and even this was obtained with difficulty. Kittoe's architecture † gives some useful details of buildings, but those selected for illustration are not of the best styles. The various Asiatic societies' journals have many accounts and illustrations of architectural interest, and the amount of picturesque illustrations of buildings by means of drawings, and latterly by photography, are abundant.‡ None of these, however, furnish adequate matter for teaching Indian architecture to either natives or Europeans.

Between 1862 and 1865 Lord Canning employed General Cunningham on an archæological survey of India, and much valuable work was done. Lord Lawrence abolished the appointment.

In 1866, two beautiful volumes were published on the architecture of Beejapore§ and Ahmedabad‖; the latter work was brought out under the auspices of Mr. Hope, and both contain drawings and details to scale which leave little to be desired. During the Paris Exhibition of 1867 an interest was awakened in England for Indian architecture, which led Sir Stafford Northcote in 1868 to make the suggestion to the Government of India to conserve and record the most remarkable of the ancient monuments in that country. Government accordingly passed a measure encouraging amateur photographers in the taking of views of architectural buildings, and offered to pecuniarily assist them in so doing. Soon after a more comprehensive measure was initiated by Sir E. C. Bayley, by which the surveying of Bengal, Madras, Bombay and the Upper Provinces was assigned to various parties who were charged to record, as far as possible, the measurements, and take photographs of buildings and monuments, and plaster casts of carvings and sculptured figures. This system, under the administration of Lord Mayo, produced many important results; drawings and casts of elaborate buildings were made by Mr. Locke in Bengal, and Mr. Burgess in Bombay; and Captain Cole in the Upper Provinces, surveyed buildings in Kashmir, near Agra, and those near Delhi. The results of some were published by the Secretary of State, the Arundel Society, and otherwise. Advantage of this organisation was taken by the South Kensington Museum authorities, who obtained casts of various Indian subjects, and exhibited them in a special Court. As this and other work proceeded, Government determined in 1870 to reappoint General Cunningham to investigate the archæology of India, and the publication of his reports has thrown new light on many obscure points, whilst Mr. Burgess's researches in Bombay have added greatly to available information.

In 1875, as alluded to before by me, Sir John Strachey organised a system for recording and restoring fine buildings in the North-Western Provinces. Many valuable and important works have been undertaken and are still going on. In 1876 the Duke of Buckingham made an effort to establish an Archæological Department in Madras.

Mr. Fergusson's new volume on the History of Eastern Architecture constitutes an exhaustive general review, but it does not pretend to be more. He says in his introduction, "without preliminary or subsequent study it can hardly be expected that so new and vast a subject can be grasped, but one volume may contain a complete outline of the whole, and enable any one who wishes for more information to know where to look for it, or how to appreciate it when found."

4. When all the information, such as plans, drawings, and photographs, have been collected together, much still remains to be done before we are in a position to judge as to what buildings should be preserved, or to what extent they should be restored. The localities of the best architectural buildings are for the most part well known; what is required is, that they should be carefully surveyed and measured, and that we should be made aware of the state of their preservation. In this way, too, some necessary materials would be completed for elucidating the systems of the natives in the construction and architecture of their buildings and works of public utility.

5. The building arts of Hindus and Muhammedans are falling into disuse, and becoming corrupted by European influences, hence the importance of studying Indian architecture and construction as it once existed. The practical use of encouraging such a branch of study among natives in the engineering and other colleges of India lies in the fact that native styles are in many cases the most suitable for public buildings in this country. They suit the native habits and tastes, and in many instances better meet the demands of comfort and health in fierce heat, than the styles of more temperate Europe. There can be little doubt that buildings for native purposes, such as the following, should be built in some style of native architecture:—Temples, Mosques, Palaces, Colleges,* Schools, Markets, Hospitals, Asylums; whilst those specially for the comfort and wants of Europeans, such as residences, churches, offices, railway buildings, &c., are more appropriate in some European style adapted to the various climates of India.

6. Innumerable evidences are daily springing up, all of which prove that European rule has hitherto tended to debase Indian art. Hindu brackets, Mogul arches and domes, Gothic windows, and Greek columns are considered suitable features to introduce together in the same design by the modern native designer; as he is taught no better, the evil increases with every new large native building, and many hundred thousand pounds are annually misapplied, whilst we have the power of encouraging the older and purer methods of building. In advocating the use of native architecture for *some* buildings, I wish to guard myself against a possible charge of seeking to introduce an elaborate and costly style. No doubt, many old structures of this country were exceedingly costly, and would be impossible to reproduce without returning to a system of forced labour, but both Hindu and Muhammadan buildings are to be found which are perfectly plain and good in design on account of the correctness of their proportions. It is as easy to have a simple Hindu or Muhammadan design as it is to have a simple Italian one, and both Hindu and Muhammadan buildings may be simple, whilst Gothic styles demand much elaborate detail.

7. Modern Indian architecture, besides being corrupted by foreign styles, is also frequently debased by the wrong use of plaster in imitation of stone. In ancient buildings there was always a consistency between material and style, but this consistency threatens to vanish, and become a thing of tradition. Plaster is constantly being used, when there exists a certainty of its crumbling away in a few years from exposure. Ornament expended in such a material is absolutely wasted. I understand that in Gour in Bengal, where stone is not procurable, there are many buildings of good honest brick, ornamented with pillars and details in hard-baked clay, taking a beautiful polish. Terra-cotta details are often to be found elsewhere, and in studying such old work the use of durable material may be revived.

8. There should be two kinds of survey undertaken by the new Imperial Department:—

(1.) Survey for purposes of preservation or repair of fine old buildings.

(2.) Survey for collecting all information about the construction and details of different styles of architecture.

The first step is for existing information to be reviewed. Reports, drawings, plans, photographs, and private works should be examined, and the general condition of well-known buildings throughout India should be ascertained from existing reports and from Local Governments.

The survey should then be commenced and *materials* collected:—

(1.) For ascertaining the cost of preservation or repair.

(2.) For compiling a standard text-book on Indian architecture. No means should be spared to make the illustrations as excellent as possible; and just as the Roorkee College has its work on

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* Restoration should, in my opinion, be rarely undertaken; it is impossible to perfectly reproduce old work, and the cost of trying to do so is almost always excessive.

† To be a text-book on the different styles of building, as distinguished from records of objects of mere antiquarian interest, which is fully cared for by General Cunningham.

* Ram Raz's Architecture of the Hindus, 4to., 1834.

† Kittoe's Illustrations of Indian Architecture from the Muhammadan Conquest downwards. Calcutta, 1838.

‡ See works of Babu Rajendra Lalla Mittra, Buchanan, Hamilton, Burgess, Cole, Cunningham, Daniell, Fergusson, Impey, Lyons, Rousselet, Tod, Wilson, &c.

§ Architecture of Beejapore, photographed from drawings by Captain Hart and A. Cumming, C.E., and on the spot by Colonel Biggs and Major Lock, with Text by Colonel Meadows Taylor and J. Fergusson.

‖ Architecture of Ahmedabad, 120 photographs by Colonel Biggs, with Text by T. C. Hope, Bombay C.S., and Jas. Fergusson.

* Such works do not come directly within the province of Government, but it is our duty to endeavour to encourage in them a good and pure style of native architecture.

engineering compiled for the special purposes of India, this work could be the means of instructing natives and others, and be used in all schools and colleges throughout India. By such means alone can Government make a beginning to teach natives the skilful art practised by their ancestors,—now almost a tradition. As regards preservation, time and decay wait for nothing, —not even famines,—and it may be worthy of consideration to spend some amount of relief in the cost of preventing old buildings from utter ruin.

9. In carrying out these general measures, none of our existing organisations should be disturbed, but the object should be to utilise all information, to make up deficiencies, and to bring all efforts into harmony.

10. Having thus pointed out what I consider to be desirable in this matter, and anticipating that these proposals are in accordance with the views which his Excellency has expressed to me, I would propose that Captain Cole, R.E., be entrusted with this work.

I would provide him with a draughtsman or two, and thus relieve him of the mere mechanical portions of his existing duties, by which means this measure will be initiated at a trifling expense.

Captain Cole has had many years' experience in architecture, and from 1868 to 1870 was employed on the archæological survey of the North-Western Provinces, and in making casts of fine architectural subjects, and I see by the Home Department Proceedings of December, 1876, that last year the Madras Government before its famine offered him the post of Archæological Surveyor of Southern India on Rs. 1,200 a month.

A. CLARKE.

VISITS TO DOULTON'S, MAUDSLAY'S, AND BLACKFRIARS STATION.

THE SOCIETY OF ENGINEERS "ON THE SURREY SIDE."

ON Monday last, some sixty or seventy members of the Society of Engineers, headed by Mr. R. P. Spice (president), Mr. J. Bernays (vice-president), and Mr. Perry F. Nursey (secretary), spent about five hours in visiting the three establishments named above.

Arriving at Messrs. Doulton's potteries, at Lambeth, at twelve o'clock, the visitors were conducted over the extensive premises by Mr. Henry Doulton, who kindly gave full and lucid explanations of all that was to be seen. The dexterity, almost amounting to magic, with which the potter converts a mass of "slip," or wet clay, into a jug, jar, bottle, or flower-pot, was watched with much interest. As will be known to most of our readers, the potter uses very few tools, his chief aids being that ancient appliance the "wheel" (or lathe), upon which the clay is made to revolve, and his hands. It is not necessary that we should go much into detail in describing what is done in Messrs. Doulton's establishment, inasmuch as, in past volumes, we have gone somewhat fully into the subject.* In addition to the ordinary stoneware articles, such as blacking-bottles, ink-bottles, spirit-kegs, filters, &c., Messrs. Doulton manufacture of the same material worms for stills, large jars (suggestive of "The Forty Thieves") for chemical purposes, and the well-known drain-pipes. The stoneware jars and receptacles for chemical purposes are made in large numbers, and many of them of very large capacity. This ware, as is very well known to technical readers, is glazed by means of salt, which is thrown into the kilns when the contents are at an intense white heat, and uniting with the silica in the clay, forms a dull and infinitesimally thin, but impermeable glaze. This salt-glazed stoneware is the only material that can be used for chemical purposes, and the production of the large vessels required is somewhat expensive, on account of the risk of imperfection, for the smallest "pinhole" would render useless the largest jar intended for the storage of chemicals. The visitors witnessed the manufacture by steam-power, directly applied, of some stoneware flue-pipes, of some 8 in. or 9 in. diameter. These were made at the rate of four or five per minute, the clay being forced through a mould or die by pressure. They have no sockets; but socketed drain-pipes are made by the same means, and the socket put on by what may be called the "parting touch" of the machine. But of stoneware pipes, and stoneware generally, a great deal has been said in the *Builder* in past years.* We may, however, state here that the clay used comes principally from Devonshire, Cornwall, and Dorsetshire, and contains a large proportion of silica. Of the same ware the visitors saw in process of being "thrown" on the wheel some of the old-fashioned "Toby" jugs, which are a characteristic and staple product of the Lambeth potteries. The raised figures, trees, windmills, &c., are stamped out separately, and then applied to the surface of the jug, in the same way as in Wedgwood ware. But, as our readers know, prosaic and utilitarian as are these applications of stoneware, the material has of late years, thanks to the intelligent enterprise of the Messrs. Doulton, been ennobled by the handiwork of the artist. The excellence of design and variety of colour which are combined in the Doulton ware have been frequently commended by us. The ware is no unworthy successor of the *Grès de Flandres*, and as it is fired by direct application of the heat of the kiln, without being placed in saggers, the colours are blended and harmonised in such a manner as to contribute in no small degree to the artistic effect. The capabilities of the material, and the range of colour available, have only been brought out by long-continued and costly experiments, united with the artistic efforts of Mr. John Sparkes, head-master of the Lambeth School of Art, and some of his pupils.† No two articles are ever produced alike, except occasionally when a *pair* may be required; but under such circumstances only *one* pair is produced. Latterly, Messrs. Doulton have sought to introduce this ware as a material for the permanent polychromatic decoration of buildings. In their anxiety to show the undoubted capabilities of the material, in applying it to their new buildings in High-street, Lambeth,‡ and on the Albert Embankment,§ they have, as many think, somewhat "overdone" it.

Although the visitors on Monday last were engineers, they were shown some few things of special interest to architects. First and foremost, we must mention the new reredos for York Minster, which is being executed by the orders of Mr. Street, the subject being the "Crucifixion." It is to be in terra-cotta, and the visitors saw it in process of being modelled. Mr. Tinworth is the artist engaged on this work, which he is treating entirely in his own way. Although not yet complete, the work promises to be very successful. We have already‖ noticed with commendation some of Mr. Tinworth's productions, and it may be interesting to state that this rising artist was, only a few years ago, a working wheelwright. Becoming a student of the Lambeth School of Art, however, he evinced an amount of latent artistic power fully sufficient to justify his adoption of an artist's career. Other items of interest to architects were a series of twenty-four capitals being modelled in terra-cotta for St. Bede's Roman Catholic College, Manchester.¶ As bearing on the recent discussion at the Architectural Conference on "Mural Painting,"** we may put on record that the visitors were shown two paintings on tiles,—one, "The Pilgrim Fathers," by Mrs. Sparkes; and the other, "The Lion in Love," by Mr. Symons. In both these works, however, the joints showed up much too prominently. These pictures were originally intended to form part of Messrs. Doulton's show at the Paris Exhibition, some particulars of which we gave a short time ago (p. 304, *ante*). After inspecting some of Messrs. Doulton's specialities in the way of stoneware traps, sewer invert blocks, vitrified stoneware sinks and urinals, Stanford's patent joint for stoneware pipes, not forgetting the blue Staffordshire bricks, copings, ridge and paving tiles, &c., made at the firm's works at Rowley Regis and Smethwick, the visitors departed, all thanking Mr. Doulton for his kindness in accompanying them over the works.

Proceeding to the world-renowned engineering works of Messrs. Maudslay, Sons, & Field, Westminster Bridge-road, the visitors were received and conducted over the extensive premises by Mr. Crosland. The vast establishment is almost entirely, if not exclusively, devoted to the production of marine engines. Many of our costliest ironclads, and whole fleets of our ocean-going steamers, to say nothing of men-of-war and merchant steamers for foreign nations, are propelled by machinery which has been made by the firm. As was indicated in a descriptive sketch which appeared in the *Builder* in 1860,* the establishment has grown from very small beginnings to its present extent and pre-eminence. The founder of the firm, Henry Maudslay, was the architect of his own fortune. But to proceed with our record of the visit of the Society of Engineers on Monday last. The visitors were first of all shown a large number of models (in motion) of the various types of marine engine which have been in vogue and made by the firm since the introduction of steam navigation. The inspection of these models in their proper sequence was most instructive. Proceeding into the "shops," the visitors were struck by the comparative absence of works in progress. The prevalent depression in trade and the long-continued threatening aspect of the political horizon, have made themselves felt, as elsewhere, in Maudslay's factory, for whereas there is very little work in progress for our mercantile steam-ships, defensive preparations are absorbing most of the activity of the establishment at the present time. When the establishment is in full work, it gives employment to 1,400 or 1,500 hands, and, with the two subsidiary establishments on the banks of the Thames (at Westminster Bridge and East Greenwich), to 2,000 hands. Proceeding to the "erecting-shops," the visitors saw four pairs of engines in progress for her Majesty's ships *Orion* and *Belle Isle*,—the two ironclads purchased of the Turkish Government. The peculiarly-devised machine for turning the ponderous crank-shafts excited much interest. Passing through into one of the lathe-shops, the visitors saw at work two of the vertical-cylindered "table" engines made by the founder of the firm, and bearing date 1824 and 1825 respectively. These engines have,—subject, of course, to repairs and renewals in some of the most vital working parts,—continued at work for more than fifty years,—and still have plenty of work in them. This says something for the excellence of the firm's productions. The foundry has one peculiarity of arrangement,—*i.e.*, it is on the first-floor level, supported on brick arches. It seems that this peculiarity was dictated by accidental circumstances; but it has since been found of inestimable value, inasmuch as the pits are always above the ground level, and, therefore, always dry. This is a point of exceptional importance, for if the foundry floor were on the level of the ground, the pits would be below the level of the Thames, and always damp, the factory standing on a portion of the low-lying once marshy ground of Lambeth. The boiler-shop was inspected by the visitors, but not much was going on there, the principal portion of the boiler-work being carried on at the firm's premises at East Greenwich. In one of the erecting-shops the visitors saw a number of screw-propeller blades in course of erection and finishing. Some of these weighed about twelve tons each. They are of brass or gun-metal, cast in three pieces (where there are two blades), the blades being fixed to the boss or central portion by means of bolts. It is customary to make the screw-propellers of some merchant vessels of cast-iron, but it was stated that this material has a tendency to become quite rotten by the action of the salt-water upon it,—that it becomes, in fact, neither more nor less than plumbago; therefore, brass or gun metal is the most reliable, and the cheapest material for the purpose in the end. One of the screw propellers seen by the visitors on Monday last was that of the Government despatch-boat *Iris*. This propeller was being polished all over in order to minimise friction with the water. We are told that this is the first time this expedient has been resorted to. In the coppersmiths' shop the visitors encountered

* In the *Builder* for 1857 (vol. xv., p. 169), we published a general account of "Lambeth and its Potteries," which included some interesting information as to Messrs. Doulton's potteries and their productions.

* In vol. xviii. (1860), pp. 241-3, will be found an article containing and commenting upon the salient portions of a paper read at that time before the Society of Arts by Mr. Edwin Goddard. Some interesting remarks made by Mr. John Doulton, in the discussion which followed, are reported on p. 242 of the same volume.

† We gave some illustrations, which afford a very good idea of the character of the ware, in the *Builder* for 1874 (vol. xxxii., p. 390). These illustrations accompanied a paper read at the time by Mr. Sparkes before the Society of Arts. In that paper, and in a subsequent one by the same author read before the Architectural Association in 1875,—reported in the *Builder*, vol. xxxiii., pp. 297-298,—the ware and its production are very fully described.

‡ Messrs. Tarring, Son, & Wilkinson, architects. Illustrated and described in the *Builder* for 1876 (vol. xxxiv., p. 1192-5).

§ Described in the *Builder* for 1877 (vol. xxxv., p. 422).

‖ *Builder*, p. 304, *ante*.

¶ Messrs. Dunn & Hansom, architects. See p. 546, *ante*.

** *Builder*, pp. 579-582, *ante*.

* Vol. xviii., p. 441.

the deafening din of workmen engaged in making copper steam-pipes, &c. In the smiths' shop, which contains a large number of forges, the visitors saw the 15-ton steam-hammer at work. [There are a larger one of 30 tons, and one or two smaller ones.] In the pattern-shop and in one of the fitting-shops the workmen were engaged on some apparatus for torpedo boats for the Government. The apparatus in question is for the discharge of the Whitehead "fish" torpedos, and consists of air pumps and reservoirs (the latter consisting of stacks of steel tubes) for storing compressed air as a motive power for the discharge of torpedoes. The steel tubes are made to sustain a working pressure of no less than 2,500 lb. per square inch. One of the steam-engines for working these air-pumps was being tried at work. Incidentally we may state that all engines, &c., are put together in the erecting-shops, and worked by steam before being sent out, all work for the Government being tried in the presence of an inspector from the Admiralty. In reference to the large store of patterns which the firm has accumulated during its long and honourable career, we may state that they are stowed away in large numbers between the roof timbers of many of the shops. In passing through one of the shops, the visitors saw a venerable old gentleman, evidently somewhat infirm, though far from inactive, moving about and superintending operations with intense interest. We learnt that he is one of the old foremen of the establishment long since retired from active work, but who, after passing some fifty or sixty years in the establishment, continues to feel an active interest in all that is going forward, and he enjoys the privilege of being free to come and go whenever he likes. His name is Peterson, and in his younger days he worked alongside of Joseph (now Sir Joseph) Whitworth in Maudslay's factory. The history of the establishment, in fact, constitutes an important chapter in the annals of British industry. While the firm has been well served by some of the most skilful artisans of the age, it has, to its honour be it said, not been unmindful of its obligations to them, and has sought in many ways to conduce to their comfort and social well-being. It is to be hoped that the establishment will soon be fully occupied in ministering to the wants of a revived activity in trade and commerce. Having thanked Mr. Crosland for his courtesy in conducting them over the establishment,

The visitors proceeded to the Blackfriars goods station of the London, Chatham, and Dover Railway, where, in the absence of Mr. Wallis, the goods superintendent, they were, under the guidance of Mr. McPherson, chief clerk, shown the very complete hydraulic machinery in the form of lifts for raising trucks from the ground to the railway level, cranes for loading and unloading trucks, and "cat-heads" or capstans for hauling the trucks from point to point. The machinery, which was erected some twelve or fourteen years ago by Sir W. G. Armstrong & Co., is very complete, and possesses the great merit of being very economically worked, one steam-engine sufficing for the whole of the hydraulic apparatus. Having thanked Mr. McPherson for his explanations, the visitors left the company's premises, many of them winding up a very agreeable and instructive day by dining together at the Guildhall Tavern.

ON ARTISTIC IMPROVEMENT OF THE POORER LOCALITIES OF LARGE TOWNS,

WITH SPECIAL REFERENCE TO THE EAST OF LONDON.

AT the close of the paper on this subject read by Mr. H. H. Statham at a meeting of the Social Science Association,*—

Sir Antonio Brady said the paper read was admirable and suggestive. As an old inhabitant of East London he could testify to the horrible bricks and mortar abounding there, which was almost a disgrace to the age. Any one who had been to some of those curious old cities on the Continent, as in Holland, would remember how they valued a sky-line, than which nothing tended more to the beauty of landscape. Mr. Beresford Hope, while president of the Institute of Architects, did much to impress the notion of a sky-line. People going through the streets of London would notice an improvement in this respect, while buildings for commerce showed more beauty. If all the fine buildings in London could be put together, our city would be far from the unbeautiful place it is. But as London was by degrees being rebuilt, such a lecture as they had heard that night would go far to revive the taste of the people in future. People of large fortunes who built large buildings in London had a deal to answer for if they did not lead the taste of the people so that they might be improved in their æsthetics as well as in their sanitary condition. Some years ago they had the opportunity of building an East London Museum to improve the taste of the people. Lord Lennox then read a paper, in which his lordship showed there were 19,000 drawings of our great artist, Turner, not made use of which ought to be. It was proposed that they should be lent to different towns that would provide for their safe-keeping. It would be better if artists and those having the custody of such works would leave them to the nation; but it was small encouragement for them to do so when they were tied up by law in the way they were, so that the trustees could not make the use of them they should do. All those things depended one on another, and when once the people had a taste for pictures, &c., we should have improved dwellings. There must be broader streets, or the lofty buildings towering to the heavens will interfere with the circulation of the air, while the folly of cutting up streets so that proper circulation was impossible could only be cured by the influence of such a lecture as they had listened to.

Mr. William Botly had always advocated that there should never be less than 80 ft. between rows of cottages, so as to secure proper ventilation, sewerage, gas, &c. With respect to curves and crescents being ornamental, as the paper suggested, there were some objections to such things, for they were not considered by many so healthy as houses in straight lines. When the British Association, and the Social Science Association, held congresses in Glasgow and surveyed the town, it taught a lesson, for no place in the kingdom had made greater sanitary advancements. He was shown one row of houses, built in a crescent, worth from 80*l.* to 100*l.* a year each: they were last year ordered to be pulled down, being considered unhealthy. With regard to water-courses, however good they might be at first, they eventually became ditches and very unhealthy. In Salisbury, where that system of supply had ceased, and recourse been had to a different one, the death-rate had been brought down from 26 to 17 in the 1,000. With respect to the height of houses, Edinburgh has a law whereby houses were limited to a specified altitude in proportion to the street. People therefore had a better chance of seeing the sky and breathing fresh air.

Mr. Serjeant Pulling said the remedy for the existing state of things lay with the Board of Works. Time was when art was king, when Sir Christopher Wren had all the power, and had the noble chairman been in possession of the same authority of late years he might, possibly, have been able to achieve the suggestions made in the paper. If the Board of Works had the power when improvements were suggested, they might call in scientific assistance and put a veto upon the ugliness under which this city suffered. There were changes, however, going on. There were public institutions, held for public trust, which had been built over within the area of the City of London, spots that were once devoted to public purposes for recreation. He instanced the whole of Moorfields, now covered with houses, but granted to the City of London for the same common purpose of recreation. Smithfield again, once used for racing, granted to the City for the same common purpose, all built over with large buildings, but unfit for an open space. He asked them to look at the case of the great Corporation of London, and to look at the instances of small parishes, with churches, with certain ground around them. The churchyards gradually diminished, were circumscribed and built over, and became an eyesore. There was, however, a revival on that point, for everywhere a spirit had set in for turning those wretched places into gardens. They could not now make amends for the breach of trust and the defaults of those who had passed away; but they could do this, that when a scheme for a public improvement was in future made, a prohibition against building over vacant spaces could be issued, and so preserve them intact for the public enjoyment.

Mr. Safford had in his twenty-one years' experience of the East of London observed a latent desire for taste amongst the lowest classes. He stated that it was noticeable that those public-houses which were most decorated with pictures, and showed a slight artistic taste, were most frequented by the poor. He thought terra-cotta might be more usefully adopted. Building in concrete might be more extended, and the material might be brought to an extremely fine face. Another thing was Etherean marble, which could be procured at a small outlay, and was valuable. He agreed with regard to the difficulty of the water question. Carrying a stream of water through the streets would be very well if we were in a place like the Salt Lake City, but in Whitechapel he was afraid it would not do, as it would be made the receptacle for dead cats, &c. Moreover, the owners of those houses were not the right class to assist in such a matter. More compulsory taking of land was required. In Southwark there were a number of houses with gardens very close to London Bridge. There was plenty of room in Southwark for building workmen's dwellings without erecting them so lofty. The regulations in those buildings, such as that a man was not to repair his own windows, &c., and the congregating of large families, led to incessant quarrels, and the whole management of such places was distasteful to the people living in them. A man should have an interest in his own house. He urged the more frequent planting of trees; the giving people flower-shows, museums, and arts, and the increase in the number of such museums as that at Bethnal-green; they took the people from public-houses, and by doing that they took them away from swelling the great army of the criminal class. Therefore, every farthing spent in increasing beauty and cultivating taste was saving the payment of thousands in reformatory schools and prisons.

Mr. Ford took an opposite view to that of the paper read. They must take the streets as they were, and the houses also. It was utopian to talk of demolishing old streets and creating new ones for our own generation. There was no reason why in future properties an improvement should not be made in respect to the sky-line and the formation of streets. They must avoid water-channels in future, which only harboured disease. The great question would be, where and how to plant trees so that boys should not destroy them, or lay down gas-pipes the leakings from which would not kill the roots. He agreed that our architects were endeavouring to get as near to the moon as possible.

Mr. Rowland Hamilton remarked that the paper said all buildings and workmen's dwellings should be self-supporting and remunerating; but there was a point beyond that, where a certain amount of expenditure might be incurred with unmitigated advantage to society in general, which arose out of the condition in which we found ourselves. We have to remedy the errors of several generations and compete with a vast evil. It was the history of past failures they had to study. It was the risk of first experiments and acquiring knowledge of companies which might be formed for improving the dwellings in poorer parts of towns to which the Limited Liability Act might be applied. When those Acts were first discussed they were regarded from two sides:—1st. The danger they created by inflating a vicious kind of monetary speculation. 2nd. They were regarded as likely to ameliorate the condition of the poor and develop many useful industries. Experience had shown that the public had been very much more hearty with the abuse than with the use of this Limited Liability Act. Nevertheless, there were many companies which might be established with the safeguard limiting the loss which might be undergone, and yet those undertakings might be entered into with a large and liberal spirit. They must not be the subject of lax mismanagement, which would vitiate the enterprise and do away with experiments altogether.

The Rev. Thomas Marsdon thought the habits of the people had led to the erection of houses towering up to the skies. Trade was diffusing railways all over the country, and houses followed suit. What was wanted was small cottages with gardens and wide streets. They could not depend on landlords for that; if done at all, it must be done by the Board of Works. He defended churchyards against being converted into recreation-grounds, declaring it a sacrilege. He respected ancestry, and thought it would be a pity to do anything in churchyards against feelings so sacred among all nations.

Mr. Arntz said when Parliament dealt with the subject it permitted itself to be governed by

* See p. 587, *ante*.

the rights of society and the rights of property. That created a difficulty in dealing with a question of this kind, because Parliament had said that no buildings should be erected in any new street of greater height than the width of the street, also that the building should not go beyond the line of front of particular streets. Good as those regulations were they were prevented from carrying them into effect by little hitches in law courts. He thought the views of the last speaker, although antiquated, must be respected, because they were held by such a large and powerful class, who could enforce them. They must look to future enlightenment and education to remove such prejudices.

Mr. Aitchison remarked that Hume said that where there were no great philosophers and metaphysicians they would not expect to find good carpenters or wheelwrights; and so where there was no great taste among the upper classes they could not expect to find it among the lower. If they were to have anything like taste for beauty the desire for it must be spread among all classes. As far as ornament went, until some large portion of the population had some desire for a particular thing, ornament would be useless; for at present the only ornament we had now was what we copied from some other nation, or some other epoch, which this nation considered as beautiful; but, as far as we were concerned, there was nothing in nature that we admired or cared for. Many of Mr. Statham's suggestions might be put into practice. At present, as far as he could see, as regarded taste, there was some kind of feeling for arithmetical proportion—not that the openings and spaces should be put haphazard without regard to one another. He thought it was a mistake that we should overlook beauty in all the things about us, either in our buildings, our furniture, or our dress; and an endeavour should always be made to impress strongly on mankind a desire, a love, and an appreciation for the beautiful.

Mr. E. C. Hope did not think we had arrived at that low state mentioned by the last speaker. There were examples existing now of what had been done, and which might very well be duplicated and increased in London. He mentioned several estates, covered in a few years by very agreeable designs, which were excellent works of art. Old buildings might be made better; but it was of no use attempting to rebuild a whole town; but opportunities, constantly occurring, for improvement should be seized upon. He thought, by a little generous circulation of opinion on the subject, they might get persons together who would be satisfied with a moderate return for an investment, and an improvement in the localities complained of.

The Chairman (Lord Henry Lennox) said if proof were wanted that the buildings in poor localities were not satisfactory, any discussion of the subject at a meeting like that must tend to do good and improve the state of things. He did not understand that the reader intended any violent or revolutionary measures with regard to the pulling down of houses, but merely that houses requiring embellishment should receive it. Health was the first consideration in any expenditure of money for improving the dwellings of the poor. Happily health was not antagonistic to beauty; it required space, and when they had the latter it was easier to give beauty than when the space was confined to a narrow area. His lordship did not agree with the Rev. Mr. Marsdon about burial spaces, for the more of such things in London for free air to pass through, the better. He himself subscribed last year for converting a churchyard, no longer used, in the East End, into a garden with trees, and so enabled the poorest who could not go any distance from their homes to take an airing on a Sunday afternoon. He had ancestors, and he should consider their remains rather honoured than otherwise by the burial-grounds being converted into recreation-grounds for the hardworking sons of toil of London. He was sorry to say the Office of Works had very little power over the poorer districts of London; but it had power to put a veto on any peculiar monstrosity in any buildings within its jurisdiction. He had done so, but had met with the fulmination and the thunders of contractors. That kind of veto might be exercised. He could only regret, wishing as they did to see towns improved, that the duties should ever have been divided between the Office of Works and the Office of Woods and Forests, making it necessary to have divided action, which made it difficult to carry out any works of the kind. This was not the first time he had taken up the question of open spaces. When he first took office, Bethnal-green was standing in a horrible ploughed field; and his predecessor, Mr. Ayrton, against whom the public took such antipathy, said: "Do what you may, my dear Lord Lennox, you will never get that space made into a garden: the Treasury will not hear of it." His lordship, however, went down with Sir Antonio Brady, and subsequently it was consecrated for the use of the public, and had since been used by all the working classes in that densely populated neighbourhood.

Mr. Statham, in reply, remarked that his suggestion about ornamental water supply was only tentative; but still he thought it could be done without injury to health, and that when the people saw it was there for their good they would not illtreat it. The gentleman who thought they could do without rebuilding should walk through some parts of Bethnal-green, and he might see reason to reconsider his opinion. The intention of the paper was not, however, by any means, to advocate the wholesale rebuilding of London; but only the making use of every opportunity for improvement as it occurred. Hardly six months passed but something was done which could not easily be undone, and unless those interested in the subject kept an eye on alterations, and endeavoured to get the right thing done, no progress could be made, and opportunities for improvements would be continually thrown away.

CONTINUED PROGRESS OF RAILWAY CONSTRUCTION.

THE HALF-YEARLY MEETINGS.

THE half-yearly meetings of the railway companies, just brought to a close, have been of a rather protracted character, having only concluded within the last fortnight with the meetings of the Scotch and colonial companies. The proceedings show that very extensive works are still in progress by several of the great companies, whilst further undertakings of considerable magnitude, and involving a large outlay of capital, are contemplated. In illustration of the enormous sums which have within a comparatively recent period been sunk in railway construction, it may be incidentally stated that Sir Edward Watkin observed at the meeting of the *Manchester and Sheffield Company* that within the last ten years the sum of 310,000,000*l.* had been expended on new lines and buildings in the United kingdom.

At the meeting of the *London and North-Western Company*, Mr. Moon, the chairman, made an important and marked declaration in reference to trade unions and Government regulations which had affected railway-making and other works of construction. Adverting to the general depression of the trade of the country, he said he trusted it would come round again, though there did seem something wrong when we found foreign states competing in our own districts; and when we were undersold by foreigners in our own markets in glass, manufactured iron, in screws, and many other things. "I believe," said the speaker, "that is largely owing to the Government regulations, and the restrictions of trade-unions. I have calculated that there is a loss of something like the labour of a million and a half of men following the restrictions which trade unions have put upon their members in regard to the work they are to do, and the hours they are to be employed. I can see no advantage which accrues to the community, except that we are suffering from a competition which we ought to be able easily to encounter and to beat. The only fear that we have in this country is that the trade-unions and the Government Regulations,—because Government now interferes in every act of every manufacturer in the country,—will together do what such restrictions have done all through the word's history. It will be found that these attempts to regulate trade will drive it from the country, because capital is of no country, and will not stand such regulating; and certainly masters will not stand to see their business going, because men, instead of doing what they have to do with all their might, will really only do little more than half the work they did in old days, and allow themselves to be beaten out of the field by foreigners who can and do more work in a day. We hope, however, that the country will right itself, and that we shall right ourselves. I mention that because otherwise we should have no sanction for the large amount of capital which we want you to spend, if it were not for our faith that the country will right itself, and that trade will revive. But we are passing now through a very dangerous crisis; the threads of the trade of the world seem to be entirely broken, and how to piece them nobody seems to know." The report stated that the amount of capital expended for general purposes during the half-year was 277,005*l.*, and that the amount required for similar purposes during the current half-year was 281,200*l.* In addition, the proprietors were requested to vote 855,643*l.* for works in progress, 250,000*l.* of this sum being required for the completion of the Market Harborough and Nottingham joint lines; 168,000*l.* for the completion of the Bettws and Festiniog extension lines; 81,000*l.* for the completion of a new dock at Garston, near Liverpool; the remaining portion being for additional siding and other accommodation, and for additional engines and carriages, lands, and minerals. We also gather from the report that further new works on a scale of very great magnitude have been resolved upon, for which a large capital will be required. It is mainly for the construction of relief lines and the enlargement of stations in the counties of Lancashire and Yorkshire, the report observing that having regard to the annually increasing traffic in these counties, and to the length of time it will require to complete the works, it is no longer prudent to delay their commencement. The sum of 750,000*l.* had been spent upon block signals and stations, and an improved system of signalling generally, and the wages of the additional men required for working these signals was 50,000*l.* a year. In connexion with this expenditure the chairman stated at the meeting that some people who ought to know a great deal better had said that railway directors thought first of the dividend, and then of the safety of the public, which was a scandalous libel. He observed that the block system extended over 1,200 miles out of the 1,600 miles, and it was being extended continuously. He added that they must not suppose, however, that, even when it was completed, the block system would ensure absolute safety. The human eye and hand must always be responsible to a certain extent, and if the block system failed, which it would occasionally, the catastrophe was likely to be worse than under the old *régime*, when the driver was always on the watch. A novel feature in the report was a statement that an additional steamer for the trade between Holyhead and Dublin had lately been built by Messrs. Laird, Brothers, of Birkenhead, of steel manufactured in the company's works at Crewe. Clarke & Webb's continuous brake had been adopted by the company, after having been tried in every conceivable way. Already 1,300 carriages had been fitted with the brake, and the rest were being fitted with it as quickly as possible. They had established a shop at Wolverton for the purpose, which had standing-room for 110 vehicles.

It was stated at the meeting of the *Midland Company* that the amount of capital which had been expended in works during the past half-year was 1,091,000*l.*, 279,000*l.* of which had been expended on lines opened for traffic, and 539,000*l.* on lines in course of construction. The estimated further outlay on these new lines in the current half-year was 1,240,000*l.*, and the chairman observed that he was sorry they could not keep the expenditure on the lines below that sum. A large proportion of the amount was for land, for when they began to buy land in large towns now, the cost, in many cases, was frightful, but they could not help it. They were obliged to obtain it at the best price they could. The Whitecross-street Goods Station was now completed, and at work, the expenditure upon it up to the present time having been 130,000*l.*, but they had yet to expend a further sum of 14,000*l.* on some further works still required there. Considerable additional expenditure had been incurred in the removal of bridges owing to the necessity of substituting bridges of iron and masonry for the present wooden structures. The works of the Poplar line and docks had been commenced; as also the Manchester South District Line, and the earthwork and construction of the tunnels and bridges were progressing satisfactorily. They were likewise making a very large extension at the north end of Liverpool. The chairman stated that the new locomotive shops at Derby had cost them, up to the end of the last half-year, no less than 195,000*l.*, and in those shops, which were now at work, they had some of the newest and best machinery

which money would buy. In answer to a question from a shareholder, the chairman stated that he could not say that the sum of 3,809,000*l.*, which was set down as the estimated further expenditure on capital account, would be sufficient to complete the whole of the works that they had engaged to complete. Following up this answer of the chairman, Mr. Baines said that from long experience, and looking over the vast extent of the Midland system, he was led to the conclusion that it was not possible to close the capital account. Their line extended almost over the whole country, from Scotland down to the English Channel, on both sides of the kingdom, and the demand upon them was perpetually increasing. And it was impossible with such demands upon them, to avoid making such extensions as would enable them to discharge the duties they owed to their district.

From the proceedings and report of the meeting of the *Great Northern Company*, it appeared that during the half-year the outlay on capital account was 888,000*l.*, of which 163,980*l.*, was on lines open for traffic, and 725,000*l.* on new lines in course of construction. The expenditure in the engineer's department was 157,165*l.* A further sum of money had still to be expended on the Farringdon-street goods station; but it would be satisfactory to the shareholders to know that, although the directors contemplated, before that station was opened, the carriage of goods would amount to 100,000*l.*, they were now doing work to the amount of 140,000*l.*, so that the money there expended was well laid out. Upon the block and signalling system they had expended 23,137*l.*, and on the brake-power they had expended 15,000*l.* They had applied Smith's vacuum-break to 400 of their carriages and eighty-five engines. They were also trying experiments with other inventions, including the Westinghouse Automatic Brake and Clarke's brake, of which the London and North-Western Company thought very highly. The directors, however, were still of opinion that Smith's vacuum-break was the best yet invented, basing their judgment upon the satisfactory manner in which it worked upon their own line.

The *Great Western Company's* report stated that the accommodation at the Paddington station, being utterly inadequate, especially for the traffic from Slough and other suburban places, the Board had decided to construct a second arrival platform at Paddington, by which the present inconvenience and delay would be done away with. The new lines between Westbourne-park and Bishop's-road stations were nearly completed. Adverting to the Severn Tunnel, the report stated that the heading was now 2,000 yards under the river from the Monmouthshire side; and the material through which it was driven continued to be of a favourable nature, and almost free from water. The tenders which had been received for the construction of the tunnel, and of the works in connexion with it, were none of them such as the directors could accept; and it had, therefore, been determined to continue the heading, and to proceed with the sinking of the necessary shafts, so as more effectually to prove the nature of the stratification through which the tunnel will be driven, in the belief that, when this has been done, the construction of the tunnel may be contracted for on more favourable conditions. The three temporary shafts required for the construction of the tunnel itself have been let to contractors on satisfactory terms. At the meeting the sum of 251,000*l.* was voted for new works in progress, 50,000*l.* of this amount being for the widening of the line between Paddington and Slough; 20,000*l.* for the new line at Paddington, between Bishop's-road and Westbourne-park stations; and 20,000*l.* for the enlargement of the station and additional offices at Paddington.

The report of the *South-Western Company* stated that the enlargement and improvements at the Waterloo terminus were nearly completed, as also the diversion of the main line at Nine Elms, and the extension of the goods lines to Clapham Junction, and the re-arrangement of the goods yard at Nine Elms would be carried out now that the extra room gained by these diversions had been obtained. The directors trusted that only a very short period would elapse before all the works in Plymouth and Devonport, which the Company, under the sanction of Parliament, was entitled to use, would be fully completed. Mr. Watson, a shareholder, complained that the Hounslow and Isleworth district was not well served by the directors, and he urged a curve being made from Twickenham to Hounslow, where building was rapidly going forward, and where land which a few years ago could have been bought for 200*l.* an acre was now selling at 600*l.* an acre.

Two of the chief features in the proceedings of the *London and Brighton Company* were the reference to the expenditure which had been incurred in introducing the block and interlocking system and the Westinghouse brake; and also the contemplated expenditure by the Company on the improvement of the harbour of Newhaven, in Sussex. In reference to the latter, the chairman explained that the directors had undertaken it because the Newhaven traffic was growing rapidly, both with Dieppe and with Honfleur, and a variety of other ports on the French coast; but that it was cramped just now by the shallowness of the water there, and the Harbour Commissioners there had not the means of raising the capital to make the improvements. The estimated cost was 300,000*l.*, of which 100,000*l.* were for improvements in the navigation; 100,000*l.* for a breakwater, which it was believed would make it a harbour of refuge and call for vessels going up and down Channel; and 100,000*l.* as a reserve sum for making floating docks in the event of its position as a great harbour having been secured. It was believed that on these works being carried out the Company's traffic to Paris by way of Dieppe would be largely augmented.

At the meeting of the *South-Eastern Company*, the Chairman, Sir Edward Watkin, stated that in conjunction with the London and Brighton Company, the directors had agreed to complete the line from Edenbridge to Croydon, the estimated cost of which was 130,000*l.* Also to widen the line from Caterham Junction to Croydon, and to make a number of other works. There were beautiful sites for villa residences, and they might expect on the Surrey and Sussex line the same traffic as they had found on the Caterham branch.

It was stated at a meeting of the *Great Eastern Company* that the capital expenditure for the half-year had been 110,000*l.*, and that the directors had repaired and rebuilt a large number of timber bridges and viaducts out of revenue. The remainder of the Alexandra Palace branch, which would give proper accommodation to the Palace. was under construction, but as it happened to be in London clay, it had been impossible to make excavations during the winter. The Bishopsgate Station frontage works were in progress. It was intended to utilise this frontage, and to have warehouses overhead.

The *North-Eastern Company's* report stated that the capital expenditure during the half-year had been 527,809*l.* The Dearness Valley branch, which was originally constructed for mineral traffic, had been recently altered and adapted for passenger traffic. At Hull a new line of about a mile in length would be required to connect the company's railway with the new dock proposed to be made by the Hull Dock Company.

The chief features of the proceedings at the meetings of the *Metropolitan and Metropolitan District Companies* were the discussions at the meetings of both companies in reference to the Inner Circle Completion line, when the recommendations of Sir John Hawkshaw as to an alteration in the authorised route, were upheld by both companies.

The report of the *North London Company* stated that the whole of the extensive and important works undertaken by the company at Poplar would be completed by the end of July. The district they occupied was very thickly populated, and in their improvements and extensions they had had to use their compulsory powers of purchase. The chairman said some people had cried out that it was a great shame of them to turn people out of their houses and properties; but all he could say was, that the people they had bought out had been exceedingly well compensated for the property they had had to give up.

The *Lancashire and Yorkshire Company's* report stated that the directors had during the last year made considerable progress in the purchase of the property required for the enlargement of the Exchange Station at Liverpool, an improvement which had long been necessary owing to the constantly increasing passenger traffic in that important town.

At the meeting of the *London and Blackwall Company*, it was resolved to raise the sum of 300,000*l.*, to be expended on the improvement of the Fenchurch-street and other stations on the line.

THE "BLACK AND WHITE" EXHIBITION.

THE sixth annual exhibition of works in black and white is one of great variety and interest; in fact, one of the best which has been seen since this idea was started. There is much less reason than there sometimes has been to complain of the prevalence of mere smartness of sketching exhibited in "original drawings" for illustrated papers; and the great proportion of the drawings consist of really artistic and, in its way, serious work. There is only one point in the exhibition in regard to which a word of protest, or at the least a note of interrogation, may be called for. This is the occupying of a whole side of a screen by the works of one artist, Mr. Edwin Edwards, a very able and artistic master of etching, we admit, whose productions we have always regarded as among the ornaments of this exhibition, and of whose etchings we have certainly no objection to see almost any number for their own sake. But knowing that there is a great competition for a place in this exhibition, and that many good drawings are turned away, we cannot but think that the dedication of so much space to the work of one contributor, however good in itself, is somewhat disproportionate, and argues a certain degree of favouritism in the selection which cannot but excite a natural and pardonable dissatisfaction among other contributors, who find themselves shut out under the sole plea of want of space, when nearly fifty works by one favoured contributor are conspicuously hung. There is a great deal of complaint in other exhibitions in London of the close-borough system, which renders it almost impossible for those who are outside the charmed circle to get a good place, or even any place, for their drawings. The Black and White Exhibition was formerly a tolerably free and impartial one, and we hope this prominence given to one contributor in the present exhibition is not to be the precedent for a system of open favouritism. So far as Mr. Edwards's etchings are concerned, we have little but praise for them: they are admirable specimens of the art; but we do not see why in so small an exhibition any one contributor should occupy so much of the hanging-space to the exclusion of others who have their claim to recognition.

As usual, the works of Mr. Leon Lhermitte, in charcoal, are among the finest things in the collection; we specially noted the mastery of this material of expression displayed in the bright atmospheric effect of the garden scene entitled "Mont St. Père au Printemps" (51), and the pathos of the "Femmes des Pêcheurs" (315), which reminds one of Israels in feeling. "Une Rue à Landerneau" (72) is a fine study of the sordid picturesqueness of a street view interesting in a certain way from its very monotony and dulness. M. Lhermitte almost introduced this method of execution into the Black and White Exhibition, and for two or three years had it nearly his own way; but our own countryman, Mr. J. W. B. Knight, runs the French artist very close in his fine work called "Gathering Nets for Night Fishing" (29), a remarkable instance of the interest that can be extracted from so simple a subject of fisher life: there is not an attempt at presenting the scene with any extraneous effect, nothing but the presentation of the facts in a broad unpretending style, the dark masses of net on the ground serving to connect the figures, and give breadth to the whole composition. In treating such a subject, the material, charcoal, seems itself to supply something of the vague idealism which gives a poetic atmosphere to the whole, and removes it from the region of common-place. We must content ourselves with noting, in the order of hanging, some of the works which struck us as worth remark for excellence or originality and point of a special kind. Mr. Ellis's "Banquet of Life" (57), a design for mural decoration, though only a small-scale drawing in pen outline, has much interest and beauty of conception; it represents life as a feast at which men and women sit in the enjoyment of the moment, hardly noticing the fact that every now and then a figure retires silently from the table and disappears down the steps leading to the nether world: worked out on a large scale there would be scope for much grandeur and pathos in this design. "Strangers and Pilgrims," by C. T. Garland (66), is a remarkably clever

study of two dogs guarding the luggage in some locality strange to them, and which seems to puzzle them greatly; there is real and very clever humour in this. Near this is a beautiful little sepia drawing, by J. W. Waterhouse, the artist who is making his way in the Academy, but who has never done anything that we have seen so good as the face of "the flower-girl" in this little drawing (70), a beautiful bit of modelling and expression. We are not familiar with the name of Mr. W. Britten, but his two studies for figures in a picture of the "Stranded Raft" (77) make us wish and expect to know more of him. The French painter, M. Bertrand, sends a small red chalk study of the picture of a drowned girl, which every one will remember occupying the place of honour in Mr. Wallis's gallery some three or four years ago; and Mr. Aumonier has a fine study of "Easton Broad, Suffolk" (91), similar to his Academy picture of last year, but not a replica. Mr. F. Powell's "Loch Fyne Herring-boats" (111) is a beautiful and delicate drawing, though this artist loses by the want of colour more than some others. A small etching by Miss Catherine Nicholls "On the Wensum,—Dry Point" (163) has much freedom and power; "Port de Ruysdael d'après Turner" (165) is an exquisite little etching by M. Rajon; and "Fondamenta di Ponte Lungo, Venice" (181), is an etching of Mr. Bradley's showing his finest qualities of tone and freedom of handling, and remarkable for the effect of the battered and tumble-down Classic architecture, the present of which contrasts so curiously with its past. These illustrate the true qualities of etching, breadth of effect and freedom of line: we dislike a "neat" and finished etching, it is a throwing away of the real capabilities of the art. The top of the room, however, abounds with fine etchings, among which the two little figure-studies by Mr. C. Keene (211, 235), and the fine rich, yet free, work by M. Casanova, "Le Sourd" (218), may be specially noticed: also the fine and powerful "Head of an Old Man" (223), by Miss Emily Ford. On the other hand, we cannot help singling out for reprobation the etching by M. Léon Richeton (256), pretending to be "La Source, after Ingres,"—good in execution, but in drawing a mere travesty of a beautiful work, and not in the least resembling the modelling of the figure in the original: it ought never to have found a place in the gallery.

"Only a Face at the Window" (325), a crayon study of a girl's head, by Mr. Lexden L. Pocock, strikes us as very charming. Next we note Mr. Marks's original study for "Convocation" (348); and further on Mr. Lionel Smythe's "Waiting" (374), a number of Boulogne (?) fish-selling girls waiting for the boats on the steps of the quay, and presenting admirable drawing and discrimination of character. Mr. G. Addison's "Charcoal Study" (366) for a quiet river landscape has much beauty and poetic feeling; beauty too there is of no ordinary kind in the red crayon study of a girl's head by Mr. David Carr, under the title "Morning" (383). "Below Bridge" (395), by Mr. Page, is an idyll of Thames waterside life, finely told and felt; and further on Mr. Clifford exhibits an unpretending but beautiful and feeling portrait of that heroine of modern life, Miss Octavia Hill, in which the best expression of the face is beautifully caught. We may notice a fine drawing called "An Architectural Patch-work" (465), by Mr. Brewer, and over it Mr. Graham's powerful sketch for a picture of two figures, under the title of "The Philosopher's Breakfast" (466).

The door-screen is interesting for Mr. Poynter's original studies for various figures in his "Atalanta's Race," nude studies for the pose and action of the figures in the group of spectators; and the other screen, besides the collection of etchings before mentioned, contains a good many admirable works. Indeed, we have only indicated a small proportion of the things worth looking at in this very interesting exhibition.

"THE ORATORY" COMPETITION.

SIR,—As you may like to inform your readers, I write to say that the designs sent in competition for our new church will be on view in the part of our buildings called St. Joseph's Hall, on Tuesday, Wednesday, Thursday, and Friday of next week, from 10 a.m. to 5 p.m. The presentation of an address card will be sufficient introduction. The award has not yet been made.

EDWARD S. KEOGH, Of the Oratory.

South Kensington.

NEW CARLISLE BRIDGE, DUBLIN.

THE present bridge is about 70 ft. in width, and the plans adopted for its alteration, improvement, and extension were those of Mr. B. B. Stoney, the eminent engineer of the Port and Docks Board. According to these plans the new bridge will be widened to the full breadth of Sackville-street, and will be flat, so as to harmonise with the level of the adjoining streets. This will necessitate the lowering of the roadway of the present bridge 3 ft., so that the remodelled structure will run evenly from the site of the O'Connell monument to the place where Smith O'Brien's statue stands. The general design of the new bridge in architectural effect will be an exact counterpart of the existing one, with this exception,—that the alteration in the level will cause the new arches to be elliptical in form instead of semicircular, though their width will remain the same. The great obstacle to be avoided in improving the bridge was the adoption of such means as would in no way interfere with the traffic, and with this view, Mr. Stoney's plan provided the adding of two new side bridges to the present bridge, of about 45 ft. width on each side, so that the whole bridge, when completed, will be 154 ft. wide over all: comprising two roadways of 51 ft. each, two side pathways of 18 ft. each, and a central pathway for the convenience of tramcar passengers, 15 ft. in width. By means of these side bridges, the traffic can be continued while the alteration of the present bridge is being proceeded with, and so as to allow the whole space thereon to be used as a carriage-way, temporary wooden foot-bridges will be erected outside the parapets. The first operation deemed necessary was to drive a series of cross-piling immediately outside the foundations of the existing bridge, so as to prevent any of the strata on which it rested escaping when the excavations were being made for the foundations of the new sides, which are considerably deeper than those of the old structure. The borings had to be made into the rock at each side, for the purpose of making the contour of the bottom of the great iron caissons, described later on, suit the irregularities of the rock underneath. The old quay walls at Eden Quay, Bachelor's Walk, Burgh Quay, and Aston's Quay had to be taken down, and replaced by foundations sunk to a great depth below low water, to form the abutments from which the new arches spring to the centre piers. The arrangements for the construction of these centre piers by means of caissons is very interesting, as each of the four caissons weighed between 80 tons and 100 tons, and had to be lowered on to the solid rock evenly and with the greatest care,—their gradual sinking registering the progress of the work inside them. A platform for each of these bell-shaped, bottomless tanks was first provided by driving a series of piles outside the proposed width of the caisson. On the heads of these piles, longitudinal timbers were placed of sufficient strength to sustain the great weight, and to allow the big vessel to slip down inside. These caissons, which were from 18 ft. to 21 ft. in height, were 45 ft. long, having sloping sides, so that the width at the top was about 10 ft. while at the bottom it measured 17 ft. They were constructed of plates of wrought iron, ½-in. thick, strongly bound together with angle arms and T-irons. Having been thus erected on the platform over the exact site they were to occupy, upright staging, enclosing the whole outward surface of each caisson, was raised on the platform itself. This consisted of long balks of timber, considerably overtopping the height of the caisson, and across them great longitudinal timbers were placed. Suspended from these cross timbers were six or eight screws, according to the weight of the caisson,—for those on the north side of the river were 20 tons heavier than those on the south, as the rock came nearer to low water on the south side, and did not require so great a depth. These screws, 2 in. in diameter, were for the purpose of lowering the caissons with great caution and accuracy, and were attached to the sides of the huge vessels by means of lugs. Each screw was about 10 ft. in length, and was passed through the balks, upon which it was secured through an octagonal nut which rested firmly on a stationary block casting placed on top of the cross timbers. The lowering was carried on by a series of levers turned uniformly round at the same rate of speed on the top platform. These levers moved the nut, allowing the screw to go down 1 in. at each revolution, and, being simultaneously turned, the level of the caisson was maintained, and an equal strain preserved on each screw. The distance from the top of the platform to the foreshore was 21 ft., and of course the screws were not of sufficient length to permit the caissons to be lowered on to the bed of the river, but auxiliaries were brought into play in this way: as soon as the screws had been lowered down to within two or three of the last threads at the top of the nut, a clamp bar, just sufficient to allow the screw to be relieved, was suspended from the balks above, and attached to the caisson below. Then a 6-ft. link of 2 ft. 6 in. round iron, with couplings and pins at each end, was attached to the lug, and the screw run up again to its full length, being then attached to the link. This was done to each screw separately all round, and the same operation was repeated each time that it was necessary (the clamp bars being, of course, removed the instant the screws were tightened), till the caissons rested on the foreshore, which stood about 15 ft. above the level of the rock. Then came the work of excavation for that 15 ft., through boulders, clay, and other matter, till the solid rock was reached at about 20 ft. below low-water level. The interior of the caisson is divided into ten compartments, and the work of excavation is executed by divers and dredgers. The diver uses the ordinary indiarubber overall and brass helmet, with air-pipe at the back of the head, and works on an average from two to four hours at a time. The stuff detached from the bottom of the river is thrown into the centre of the caisson by the excavators, is raised by small vertical dredgers and spoons worked by crab winches, ejected into barges, and removed away to sea. This labour has been necessarily slow, especially as the divers have to work in the dense waters of the Liffey at such a depth below the surface. However, all the difficult portion, we are happy to say, has been mastered. Two of the cassions now rest on the rock level. When all the caissons are so placed on the solid rocky bed, they will be filled with concrete, which will be passed down through the water in closed self-acting boxes, which will open as they are lowered to the place where their contents are to be deposited. When the caisson is completely filled up to the level, or say from 1 ft. to 2 ft. above low water, a series of heavy ashlar granite blocks will be placed over the concrete, and from these, like the abutments, the arches will spring. The caissons will remain permanently fixed where they lie, and will be a protection to the concrete while it is hardening. It is of no matter if they get corrugated, for by that time the Portland cement concrete will have become hard and substantial as the rock on which it rests. The foundations of the abutments on Eden quay and Bachelor's-walk have been built up to the level of the springing of the arch, and those on the south side are now in progress,—the mason work at Burgh-quay being about to be commenced,—so that in a short time it is expected that the arches of the side bridges will be placed. The stone is cut to the necessary size, and is nearly all on the ground, and everything is in readiness for turning the arches. It is anticipated that the side bridges will be completed and have traffic going on them by the 1st of April next.

The water was excluded from the foundations of the abutments upon a principle pointed out by Mr. Stoney, namely, the erection of timber coffer-dams, wherein the use of clay and puddle was avoided, and whole-balk sheet-piling substituted. The piling was 12 in. square, closely driven together in twos or threes, and caulked both internally and externally with oakum, like the sides of a ship. It was considered injudicious to excavate down to the rock immediately adjoining the roadways of the quays at each side,—a depth of 21 ft. below low-water; and consequently a series of bearing piles, 3 ft. apart from centre to centre, were driven into the rock, and their heads cut off about 8 ft. below low-water, the ground being excavated to that level. They were filled round with concrete up to within 1 ft. of low-water, when a series of ashlar granite blocks were laid to bind the mansonry work immediately underneath the springing of the arches. The front row of bearing-piles was a continuous row of close sheeting. Within the coffer-dams the water was excluded by pumping engines, and the heavier materials deposited by steam hoists. This work, though very extensive, progressed more rapidly, of course, than that within the caissons, where it was executed by divers. It is only right to mention that as an additional

security to the quay walls, a set of whole-timber sheet-piling was driven immediately behind them. The great quantity of piling and sheeting about the abutments and round the foundations of the old bridge, the construction of timber coffer-dams, &c., required an immense amount of pile-driving operations, which were performed by Mr. Doherty's patent self-acting pile-driver, worked by means of steam upon an endless chain, so that the motive power of the engine is always felt. The length of the stroke, or height of fall of the ram, is regulated by a pin, placed at whatever height the stroke is required from, in the face of the wooden derrick. The self-action is imparted by means of a very ingenious arrangement. When the driver falls, a piece of iron projecting on its face acts upon an india-rubber spring in the body of the ram with just sufficient force to throw the nipper forward into the pitch of the revolving chain. The latter carries the ram up till it is again disengaged by striking the pin in the front of the derrick, and this goes on continuously. The pumping has been performed by horizontal centrifugal pumps, throwing great volumes of water when required. Head travellers, of 72 ft. span, and capable of lifting 10 tons, have been erected over the site of the new side bridges, and are ready for setting the concrete in the caissons, and placing the arch stones in position. Mills for mixing mortar and concrete are erected at each corner of the proposed new bridge. The parapets of the bridge, when completed, will on each side be set off with four three-light ornamental lamp-posts, made in the Foundry du Val d'Osne, Paris, and similar to those in the Place du Concorde. Three five-light gaseliers of a similar design will ornament the central footpath.

THE BERESFORD-PLACE BRIDGE, DUBLIN.

THE new bridge at Beresford-place, for which no name has been as yet suggested, will be a "swing" structure for the purpose of enabling vessels to take berths between the Custom House and Carlisle Bridge. It will consist of two stone arches,—one on each side of the river, having respectively a span of 37 ft.,—and two waterway passages of 40 ft. on each side of the central pier or platform on which the swing rests. The width of carriage road will be only 20 ft., with two 7-ft. trottoirs, but provision is made that, should it be deemed advisable at any time to dispense with the swing and close the navigation for larger vessels above that point, the bridge can be changed into a permanent four-arch stone one, by merely throwing two arches from the central pier to each of the side piers on which the land arches rest, and the width can be increased from 20 ft. to 70 ft. Unlike Carlisle Bridge, where the difficulty of maintaining the old structure uninterrupted for traffic retarded the advance of the works, here considerable progress has been made. The land abutments, wing walls, and arch on the south side are now completed, together with the central pier: so two-thirds of the serious work have been performed, the north arch and northern abutments remaining only to be put in place. The construction of the abutments was similar to that for Carlisle Bridge, but the arrangements for the erection of the piers were different. Instead of using caissons, a gigantic coffer-dam was erected, enclosing the site of the proposed south pier and wing walls. This was formed of a series of piles and close sheeting made water-tight by clay or puddle. It was 220 ft. in length, and extended 100 ft. into the river, being supported by a number of struts and wales. The most interesting feature in connexion with the building of this bridge was the getting into place the mason work of the central pier on which the ironwork of the swing rests, and that has been already built up to within 1 ft. or 2 ft. of high water. The coffer-dam adopted by the contractor for this work consisted of an extension of the system partially adopted at Carlisle Bridge; but, considering that the erection was in the centre of the river, surrounded by 34 ft. of water at high tide, with a pressure on all sides equal to about 16 lb. to the square inch, the difficulty of the task may be readily understood. The dam was made by a single row of whole-sheet piling, 38 ft. to 40 ft. long, driven round the space to be occupied by the proposed wall, in close contact. As the water was pumped out by steam pumps, worked by a 30-h.p. engine, numbers of ship-carpenters were employed in caulking the joints, until the whole,—about 220 ft. long by 24 ft. wide,—was made perfectly water-tight. In all cases the piles were driven down to the solid rock,—and, considering that the ground through which they were sunk consisted of coarse and fine gravel for about 6 ft. overlying a bed of clay of about 5 ft.,—it is astonishing that they were able to take such hold in the comparatively shallow depth of tenacious earth. When the interior space was freed from water, the earth was removed from the centre by steam hoists, and deposited in lighters which conveyed it away. It is supposed that it was from this excavation the very offensive effluvia, which almost sickened people in Sackville-street and its environs for a month, arose. The sulphuretted hydrogen, which had been forced down by the density of the water, escaped as the rock was stripped over a surface of 78 ft. by 20 ft., at a depth of 20 ft. beneath low water mark. It rose in such volume that neutralising agents, such as chloride of lime and chloralum, had to be employed to counteract the gas and permit the workmen to continue at their labour. The east wind which prevailed during the month of April carried the disagreeable evaporation up stream, but now that the masonry has been placed the unpleasant odour has discontinued.

To give an idea of the magnitude of the works, we may state that there are seven steam-engines of various sizes employed on the works at Carlisle Bridge, and five steam-engines, between thirty and eight horse-power, at Beresford-place Bridge, in pile-driving and pumping, and several hoisting steam-cranes. There are overhead travellers and gantreys also worked by steam, which is employed wherever they can be brought into use. At both works the number of men employed amounts to 450. The whole is being carried out under the immediate superintendence and from the designs of Mr. Stoney, by Mr. W. J. Doherty, the contractor. It is estimated that when completed the two bridges will cost about 115,000*l.*

HOW OBAN GREW.

FASHION has a greater share in building towns than she is credited with; and landowners are not slow in discovering sites on their estates where tourists, pleasure-seekers, and traders are likely to congregate. Of late years steam has afforded access to out-of-the-way places that were scarcely worthy of mapping, and one of the most notable instances is the rise of the town of Oban, on the coast of Argyleshire. This, however, is partly owing to the late Duke of Argyle, who, near the end of the last century, wishing to encourage building on his estate, got plans prepared, and offered very favourable terms. Long leases, for ninety-nine years, were offered to any one who would undertake to erect a house, according to plan, for a nominal rent; half a crown a stance being the common rate on the site of Oban.

Two brothers of the name of Stevenson, who had a contract for building a bridge at Muckairn, on learning such favourable terms, were not slow at improving the occasion. They invested their own capital and raised money by ways only known to enterprising builders, and not only built extensively, but they helped greatly to bring trade to the place.

Steamboat traffic was, however, one great aid in the development of this out-of-the-way town, and has caused Oban to become the centre of communication for all places on the West Coast of Scotland.

At present the hotels and lodging-houses are numerous and well built, and during the summer months these are resorted to by thousands of tourists from all parts of the world.

A gauge of the extension of new buildings may be taken from the fact that the rental of 1846 amounted to 1,719*l.*, while in 1877 it "slated" up to 14,562*l.*, and extensive building operations are in full swing.

American Society of Civil Engineers. The tenth annual convention of the Society was opened at Boston, on Tuesday, June 18th, 1878. Sessions for the consideration of professional subjects, and one for the transaction of business have been held, in the Hall of the Massachusetts Institute of Technology, on Boylston-street. Excursions were made and a number of papers read.

TENT WORK IN PALESTINE.

THE book which is published under this title* is a record of the survey made for the committee of the Palestine Exploration Fund, under the command of Lieutenant Conder, R.E., who in two volumes gives us the result of his observations of the country while making the survey, with some account of various incidents of the expedition, many of which fully justify the author in the remark that surveying in Palestine is not a holiday task. There seems, indeed, to have been no small amount of roughing it to be gone through, and considerable experience of the disagreeable tendencies of the natives of the country, whose behaviour must have been eminently unsatisfactory, whether they were strangers to the party or *employés* connected with it; for, even in the latter capacity, they seem to have been very ready either to make themselves positively disagreeable on imaginary provocation, or to show themselves negatively worthless by preparing to decamp when their employers were in difficulty, and most wanted faithful service. On one occasion, when all the Europeans of the party were ill, it needed all the exertions of one faithful attendant to keep the rest from leaving them all in the lurch, a catastrophe averted partly by the practical logic of the author, who, on overhearing their cook threaten an immediate flight, called out that the road to Jerusalem lay past the opening of his tent, and that if he saw the cook pass the opening he would certainly shoot him: an argument which produced the desired effect. In general, the author tells his story clearly and well, and in a sufficiently interesting manner, without the slightest attempt at fine writing. It must not be supposed that the book is in any degree an official account of the survey: about actual work little is said; it is a narrative addressed to the general reader, and the object is to trace out in the features of each district the connexion with Biblical events which are related as having happened there, and to give new reality and meaning to them by comparing the account with the actual appearance of the country, and with the existing names, customs, and traditions. The basis of this method of treatment is that the customs and names of the East are practically unchanging. "Immutability is the most striking law of Eastern life. The Bible becomes a living record to those who have heard in men's mouths the very phrases of the Bible characters." This line of reasoning Lieut. Conder brings in support for the most part of the received traditions of localities mentioned in the Old and New Testaments, the former especially; and in many cases the preservation, in a more or less recognisable form, of the original names of localities, as well as the coincidence of the character of the landscape with that described in the Bible in connexion with the incidents recorded of such localities, leaves very little doubt that we see the scenes substantially unaltered, with which the Old Testament historians were familiar. Into all the probabilities or improbabilities of these topographical speculations, however, we cannot here enter, nor are they, as far as we gather, offered as unanswerable logical conclusions, but rather as impressions derived from personal observation. It is sufficient to say here, in regard to the book as a whole, that whoever goes over it in conjunction with the portions of the Biblical narrative severally referred to will probably get a new idea of the real aspect of the country, and of the point and meaning of much of the Bible narrative, and that a somewhat vivid reality is imparted to many of the descriptions by the author's quick eye for minutiæ,—the colours of the landscape, the nature and habits of the birds frequenting it, and so on. We may, however, touch a little more in detail on some passages which have a more directly architectural or archæological interest, and suggest a good deal to architectural readers, though written from the point of view of an amateur.

Baalbec is not a new subject certainly, but it is always interesting to get the impressions of a new visitor about remains so full of interest, and Lieut. Conder's description of the famous ruins is very picturesque and vivid. He approached the temple from the town, ultimately

* "Tent-work in Palestine: a Record of Discovery and Adventure." By Claude Reignier Conder, R.E., Officer in Command of the Survey Exhibition. Published for the Committee of the Palestine Exploration Fund. In two vols., with illustrations by J. W. Whymper. London: Bentley & Son. 1878.

by "riding through a dark tunnel of huge masonry, and looked back on the green paradise of foliage, while in front a glaring dust-heap indicated the ascent into the great enclosure; hence we emerged into the centre of the ruins," the enormous size of which was not appreciable at first sight, only on going up to them and finding the bases of the columns higher than a man's stature; but this deception as to scale has nothing to do, Mr. Conder, with the building being of "graceful proportion," an old heresy of amateur writers on architecture, which it is amusing to meet with once more. A "well-proportioned" building is that which shows its size and scale; to look smaller than it really is is the very last quality to be quoted as a merit in any architectural design. In the case of Baalbec, probably the deception as to scale simply arises from the fact that only a part of the building is left, and that it stands in the middle of a waste place with no immediate object of comparison. It is melancholy to hear that the six columns which form the remnant of this monument of Roman grandeur are in a very precarious state, the bases having been undermined by those dear civilised beings, the Turks, in the effort to get at the metal dowels supposed to be in the centre of the columns; and Mr. Conder says that any winter may bring the destruction of the eastern column, and perhaps of the next two. Surely it is worth while to try to get some effort made to preserve this unique monument of architecture from further destruction. The urgent necessity for preservative measures here was pointed out in our pages some time ago. The description of the evening scene at Baalbec is worth quoting:—

"The sun was getting low as I sat sketching the six columns, which stood out dark and desolate against the glowing sky. A stork stood on one leg on the cornice, his mate was in the nest below. As I turned eastward the scene was yet grander. The Temple of Jupiter was in dark shadow, with a foreground of tumbled columns, like fallen giants, sprawling over crushed blocks and ruined cornices. The wall on which I sat was battered in by the thud of one huge shaft tossed against it. Beyond the temple, the rich tracery of the Moslem *mihrab* on the south wall was visible; and behind this, again, was the dark foliage of mulberries, poplars, and willows, and the bare grey hills, tipped with crimson from the setting sun."

The chapter on Bethlehem, "a long town of solidly-built stone houses, crowning the summits of two knolls," is interesting, and gives a different conception of the place from what most of us are accustomed to associate with it. It is almost startling to hear of Bethlehem as a "thriving modern town," in respect of which quality it is contrasted with Hebron, which the author characterises as entirely a city of the past. A detailed description is given of the basilica at Bethlehem, where the columns are "monoliths of red and white marble, painted with figures of saints, now dim with age, and scrawled over with the crests and titles of knightly pilgrims of the Crusading ages. The capitals are of the Corinthian order, debased in style, with the cross carved on the rosettes of each." The plan of the basilica, the author notes, resembles very closely the description given by Eusebius of Constantine's buildings over the Holy Sepulchre at Jerusalem. For the exceedingly curious description of the Christmas festival in the Bethlehem church, with its mingling of the picturesque and the barbarously superstitious, we must refer the reader to Mr. Conder's pages; though if he is very tenacious of his poetic and hallowed associations with Bethlehem, he might do more wisely to avoid the perusal.

The passage through Damascus, on the way to Baalbec, gives occasion for some interesting notes on the architectural and other characteristics of the city. The exterior the author describes as mean and unattractive in effect; no great wall bounds the city, which looks on approach like a straggling village of mud houses, with here and there a minaret rising above them. When they came to their hotel, they at once appreciated the real glory of Damascus, its interiors. "The house was built round an ample paved court, its inner walls of stucco, painted in horizontal bands of white, red, and blue. In the centre was a large square basin surrounded by little jets, whence the water trickled slowly. It was shaded by tall lemon and orange trees, peaches, and plums. On one side of the court opened a diwân, a cool lofty apartment, with raised floors, surrounded by low sofas, and with an octagonal fountain in the narrow central passage. The roof of this central part was more lofty, and clearstory windows let in a subdued light." The city retains its unmixed Oriental character: "no French fashion or Gothic building destroys the general effect;" and the social characteristics are in keeping with the outward appearance.

A chapter is devoted to the sacred buildings at Jerusalem, about which a good deal has been said recently. Mr. Conder gives his history of the Dome of the Rock with the same certainty as if the facts and theory which he brings forward were uncontested and incontestable, and without making even the slightest reference to the well-known theory of Mr. Fergusson, which, considering the rather loose nature of Mr. Conder's own architectural criticism and description, is showing hardly decent respect to the opinions of a very eminent architectural critic and historian. He reproduces the old idea that the "Dome of the Chain" was the model of the Dome of the Rock, in spite of their entire difference in plan, and ignores entirely the bearing on the question of such buildings as the Lateran Baptistery; and he explains the style of the Dome of the Rock by saying that it belongs to that obscure period of Saracenic art when the Arabs had not created an architectural style of their own, and when they were in the habit of employing Byzantine architects to build their mosques. He quotes, "among the rare specimens of their work at this time," the Mosque of Amrou, at Cairo, commenced in 642 A.D., and he quotes Mr. Fergusson as an authority to the effect that this building "probably now remains in all essential parts as left" by the two Caliphs who rebuilt it; but he forgets to add that Mr. Fergusson also expresses the opinion that it has nothing whatever in common with the architecture of the Jerusalem building.* This is the only reference in the chapter to the author of "the Temple of the Jews," and we must say that this method of treating him is, to say the least, not very ingenuous. The fact is, the whole Palestine Exploration party are obviously in arms against Mr. Fergusson for having disturbed their holy places; and, finding his arguments from architectural style awkward to deal with, seem to adopt the policy of ignoring him; but whether his theory be right or wrong, it will hardly be met in this manner. Indeed, it appears to us that a disproportionate amount of attention has been given, in connexion with the proceedings of the Exploration Society, to the investigations of levels of rocks, and "beautiful scarps," and so on, and too little study, and in too uncritical a spirit, to the actual architectural remains and the story they have to tell. What will interest most readers more in the Jerusalem chapter is the graphic description of what the author calls, in language apparently by no means too strong, the "annual orgy" which takes place within the Church of the Holy Sepulchre, when the populace meet to receive the "holy fire" given out through the opening of the Sepulchre. One or two bits of his description we quote, for they give some idea of a scene which, to Western Christians of the nineteenth century, seems literally incomprehensible as a sacred rite. The author on two occasions (in 1873 and '75) obtained a place in the Latin gallery west of the Sepulchre, and looking down on the rotunda. A double line of Turkish soldiers kept a narrow lane, on each side of which the crowd was packed in such a way that "to say that you could have walked on their heads conveyed but a poor idea of its compactness." They had been standing in their places more than ten hours; the Greek Christians, mostly Syrians, being worked up into a state of hysterical frenzy that did not allow them to be quiet for a moment; every now and then a man would struggle on to the shoulders of the crowd, or was pushed along over their heads as if he were swimming; these adventurous persons becoming leaders of the chants, of which the principal was "Hádna kúber Sáid—ná!" (This is the tomb of our Lord!). The scene when the natives of Jerusalem arrived is almost incredible:—

"A long wave of human beings bursting in from the south, and surging along the narrow lane. Many were stripped to their vests and drawers, in regular fighting costume. They rushed at the fire-hole, and the first-comers thrust their arms into it to keep their places. The effect of this crowd within a crowd, a moving wave, ploughing through two packed masses, was very curious. No sooner was it pushed and swept into place, and the lane cleared, than it burst into one loud shout of repetition,—

"Hádna kúber Sáid—ná!"

which was repeated twenty or thirty times at a breath; and a big man was hoisted up, and fairly pounded the walls of the Sepulchre with his fist, shrieking the same refrain, and pointing at the chapel with his fingers, while the crowd joined in the last syllable,—a tremendous shout of 'Ná!'"

* In his latest work Mr. Fergusson observes that the recent rebuilding of the Mosque of Amrou has all but obliterated its ancient features.

Such is modern Christianity in the East, apparently! And there is worse than this, which we have not space to quote.

We reproduce from Lieut. Conder's second volume the frontispiece representing "an early Christian tomb," * since it is of interest just now as further illustrating the remarks which have appeared in Mr. Fergusson's recent work in regard to the prevalence of the vine as a decoration (no doubt, symbolical) in Jewish and early Christian tombs and places of worship; concerning which that writer observes that a number of fragments of vine ornamentation, torn from some desecrated building in Syria, adorn the apse of the church of Murano at Venice; and the vine ornament also occurs on the soffit of the horizontal beam extending from column to column in the Dome of the Rock, a fact which is certainly very significant as bearing on the præ-Mahommedan origin of that building, as no one pretends that the beam is transported from any previous building. Of this particular illustration, however, we are told nothing except the vague statement that it is "an early Christian tomb"; at all events, if there is any remark in the book as to the place, date, and other circumstances connected with the illustration, we have not been so fortunate as to find it. We may note that in the second volume is an account of a collision with native prejudice much more serious than those we have previously alluded to, ending in a free fight, in which the author very nearly lost his life. He succeeded in getting the assailants punished, converting into a moral victory what was in the first instance a material defeat, so effectually, that on his companion, Lieut. Kitchener, revisiting the place two years later, their former assailants humbled themselves completely before the representative of the Franks; and probably European *prestige* in the neighbourhood has gained not a little by the courageous and firm manner in which Lieut. Conder behaved in reference to this affair.

We have only space to observe that, passing over a good deal that is very interesting in regard to the character and topography of various parts of the country, the book concludes with an interesting and suggestive chapter on the possible future of Palestine, in regard to which Lieut. Conder is of opinion that there must be a radical reform in government, encouraging a spirit of enterprise and improvement in the making of new roads, and other public works, especially a system of irrigation for developing the fertility of the land, and improvements in the sanitary condition of the towns. The native population are, he says, quite as well aware of the deficiencies of their country as any foreign visitors, and are desirous to pass into the hands of wiser and stronger rulers, and he considers the best chance for the future of Palestine would be its occupation by some strong European power which would recognise the value of the natural resources of the country, and develop them. "Till such a change occurs, the good land must remain a desolation."

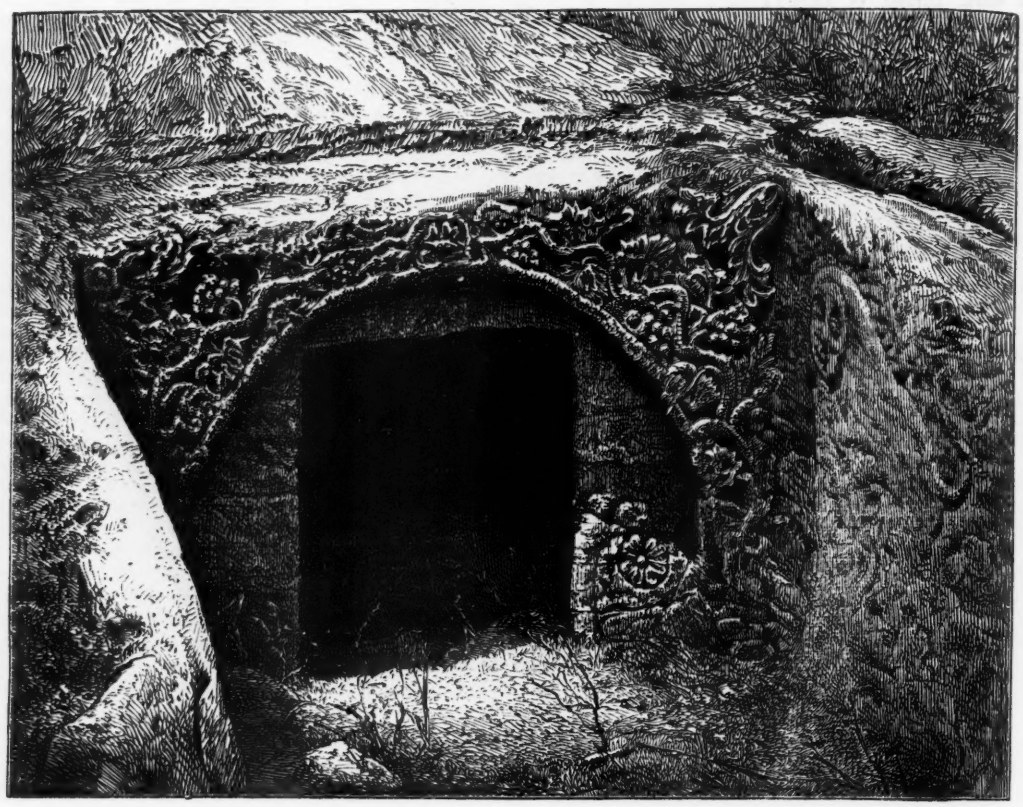
ST. MILDRED'S CHURCH, BREAD-STREET.

SIR,—This little church, out of sight and out of mind, is full of the most beautiful Classic work inside. I find a church dedicated to St. Mildred existed here as far back as the year 1333, and, being destroyed in the Fire of London, was rebuilt with the rest by Wren. St. Mildred was a Saxon (?) lady, daughter of Mer Walden, brother to Penda, king of the Mercians. Nothing can exceed the beauty of the Classic details of the interior of this quaint City church. Never did the works of nature,—fruit and flowers, wreaths and garlands, with its fine domed ceiling, surrounded by an enriched moulding of fruit work,—better adorn the "House of Prayer." Wren's master-mind truly was to be seen in the beautiful manner he has designed the details of this church interior. The pulpit and sounding-board are a masterpiece of the carver's art in oak.

I repeat what the late Sir Gilbert Scott said,—"This shameful desecration and destruction by the Ecclesiastical Commissioners ought to be stopped by some one in authority, for this scandal is already a disgrace to any Christian City."

R. PAYNE.

* See p. 644.



AN EARLY CHRISTIAN TOMB.*

A BRITISH VILLAGE AND CROMLECH IN CARNARVONSHIRE.

NEAR the coast of north-west Carnarvonshire, and within a mile or two of the village of Llanaelhaiarn are three mountains in close juxtaposition with each other, and popularly known as "The Rivals,"—possibly from the fact of their summits being very much the same in height. On one of the lesser peaks is the ancient British fortified town known as Tre'r Ceiri,—the town of fortresses,—which we have illustrated. The engraving has been made from a photograph on wood taken from a much larger camera-lucida drawing made on the mountain-top by the writer of these notes last autumn, so that the general appearance of the town, its neighbouring mountains, and sea-coast, may be looked upon as correct in all its details. The view is taken from an immense heap of large, loose, and sharp stones, piled up cairn-like, at one side of the ruinous village, and on the highest point of the mountain. The view of the neighbouring country from this look-out point is grand in the extreme: on one side is the rocky sea-coast, and on the other a mountainous and precipitous country.

The mountain on which Tre'r Ceiri is built is 1,400 ft. above the sea; but although the elevation is comparatively low the ascent of the face of the mountain, owing to the immense number of large, loose, and sharp stones, is extremely difficult. As the summit is approached, tier after tier of these loose stones of trap-rock have to be surmounted; they slide about under every step, and so cut the boots and shins that it is almost impossible to make headway. These immense terraces of stones have not got into position by accident, but they were, doubtlessly, designed to answer as outworks of the fortifications of the town above. So effectually do these stones answer their purpose of retarding an ascent, that to this day the approach to the town by the rocky side is most difficult, and cannot be made without numerous falls amongst the treacherous stones. A safer and much easier path for the ascent is from the road to Nevin from Llanaelhaiarn; but this path is difficult to find without a guide. When the small and almost flat summit of about five acres is neared, a perpendicular wall, 15 ft. high and 15 ft. broad, made of loose stones piled one upon the other, and, of course, without cement, has to be surmounted before the houses of the town can be seen. The wall is roughly flat on the top, and in some places, where the natural defences are weak, there is a series of two, or even three, walls. The entrances are three in number, with structures which would answer for guard-houses and a true sally-port. The single wall is on the precipitous side (which is so difficult of ascent), whilst the double and treble series of walls are on the flatter and more exposed positions.

The houses of the town are arranged in five larger groups, four smaller groups of four or five houses each, with a few other houses built against the inner side of the great protecting wall. The houses vary much in size, some not being more than 6 ft. in diameter measured from the inside, whilst others measure as much as 12 ft. or 15 ft., with walls 5 ft. thick. In several instances there are two rooms (if such they may be termed) to a house, the first room leading into a second. Most of the houses are circular, or rude squares with broadly-rounded angles. Most of the dwellings have an opening which must at one time have served for a door; but in many instances, there is no door at all, so that the ancient occupier probably got in at the top. In one house there is a recess on the ground line 18 in. high, and as many broad, formed by two supporting stones and a rude lintel at the top. This is considered by the Rev. E. L. Barnewell to be a cupboard, in which the pre-historic occupant kept his "things." No trace of a roof is to be seen in a single instance; but probably the roofs were originally formed of branches of trees overlaid with skins of beasts, with possibly a supporting pole in the centre. Unless, however, these roofs were very securely fixed, the storms of wind which so often scour over these mountains would make short work of them. When or by whom this fortified town was built no one knows; its position and structure show its great antiquity, and its age is not likely to be less than 2,000 or 3,000 years. During two visits made by the writer, no flint-implements or flint-flakes were found, and no instances are on record of flint implements being found in this position, though roughly-hewn celts have been met with on other mountains in North Wales. Not a trace of the men who built this town can be seen, except in the ruins of the town itself and its protecting walls. The men possibly lived on this bleak and exposed summit during the summer, but during the winter months it is more probable that the inhabitants retired to the woody valleys. There is a little water on the mountain-top, and as clouds are almost constantly resting on the crest, every little hollow gets supplied with the ever-necessary water.

Not far from this ancient fortified town (and the village of Clynnog) there stands in a field close to the seashore the magnificent cromlech here illustrated. It is remarkable for its grace, and on account of the cap-stone being profusely dotted all over the upper surface with the mysterious "cup-markings" of which so little is known. The cup-like hollows on the cap-stone of this cromlech might easily be overlooked, as the stone is rough, weatherworn, and covered with lichens; but on a careful examination it will be observed that the depressions are equal in size, and evidently worked in ages long past by man; a small number of depressions occur on the edge of the stone. A few years ago a letter appeared in the *Times* stating that the cromlech had been overturned, and that masons were at that time squaring the stones for the repairs of a neighbouring farmhouse; strangely enough, a second letter appeared, confirming the first, but neither of the correspondents had any foundation for his report, as the cromlech was intact at that time, as it is now.

There are several other cromlechs, single stones, and avenues of undressed stones in the immediate neighbourhood; some of these are marked on the Ordnance maps, whilst others are not.

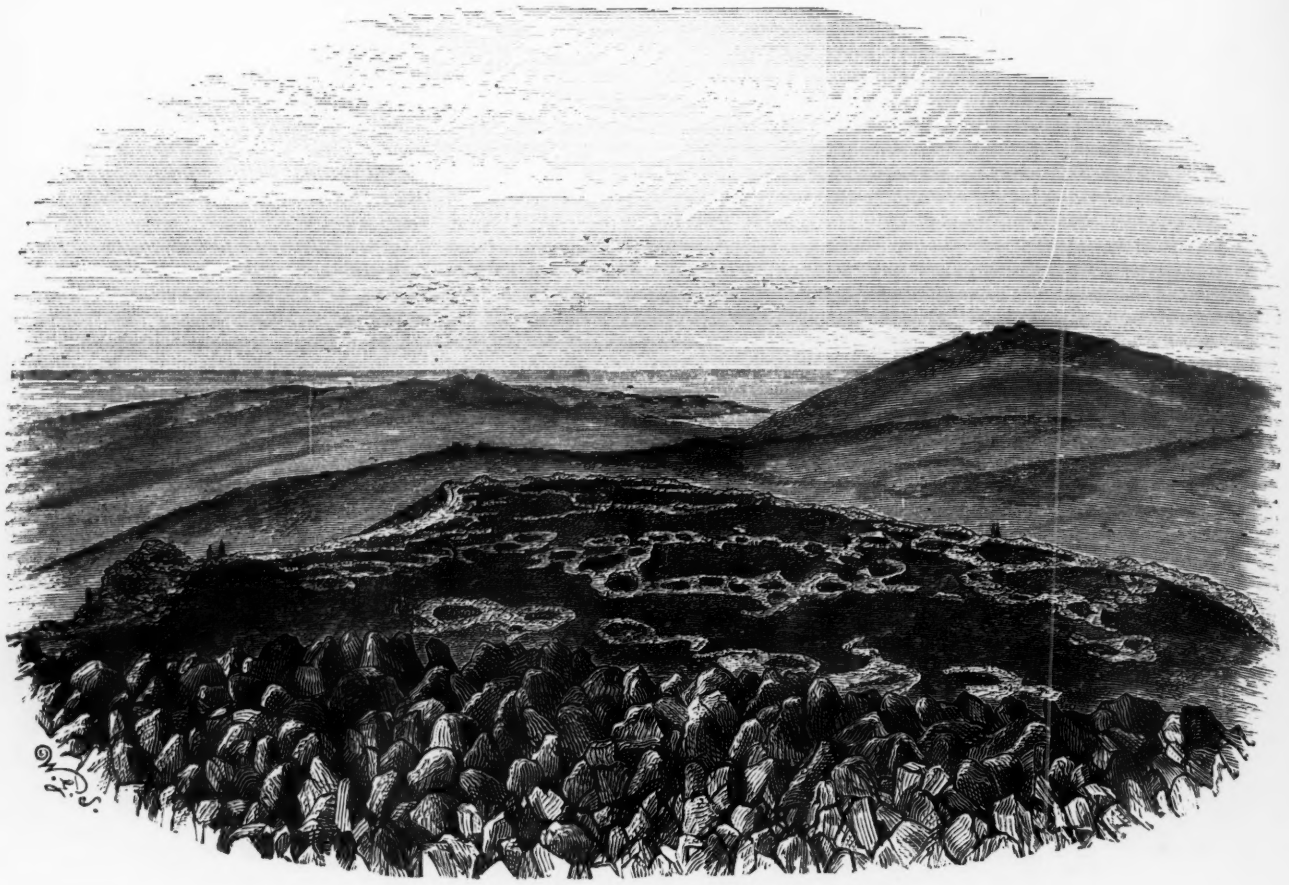
THE STREET OF STRANGERS: PARIS INTERNATIONAL EXHIBITION.

ONE of the attractions of the Paris Exhibition is certainly the international street, with its specimens of architecture of all nations in past and present styles, a pleasant and interesting promenade, in which variety offers every possible charm. Here the eye is pleased with the modest Greek and Danish mansions, and dazzled with the many-coloured Spanish façade, or lost in wonderment at the solid Belgian specimen which has been constructed in so short a space of time. The Austro-Hungarian and Italian façades are also worthy of note; but the most remarkable is that of Portugal, which has had modelled, the same size as the original, the magnificent doorway of the convent of the monks of Jeronimus, or Hieronimus, which still stands in the environs of Lisbon, in close proximity to the old watch-tower and fortress of Belem, at the mouth of the Tagus. The style is a mixture of the Gothic and Moorish, the former predominating.*

* See p. 643, *ante*.

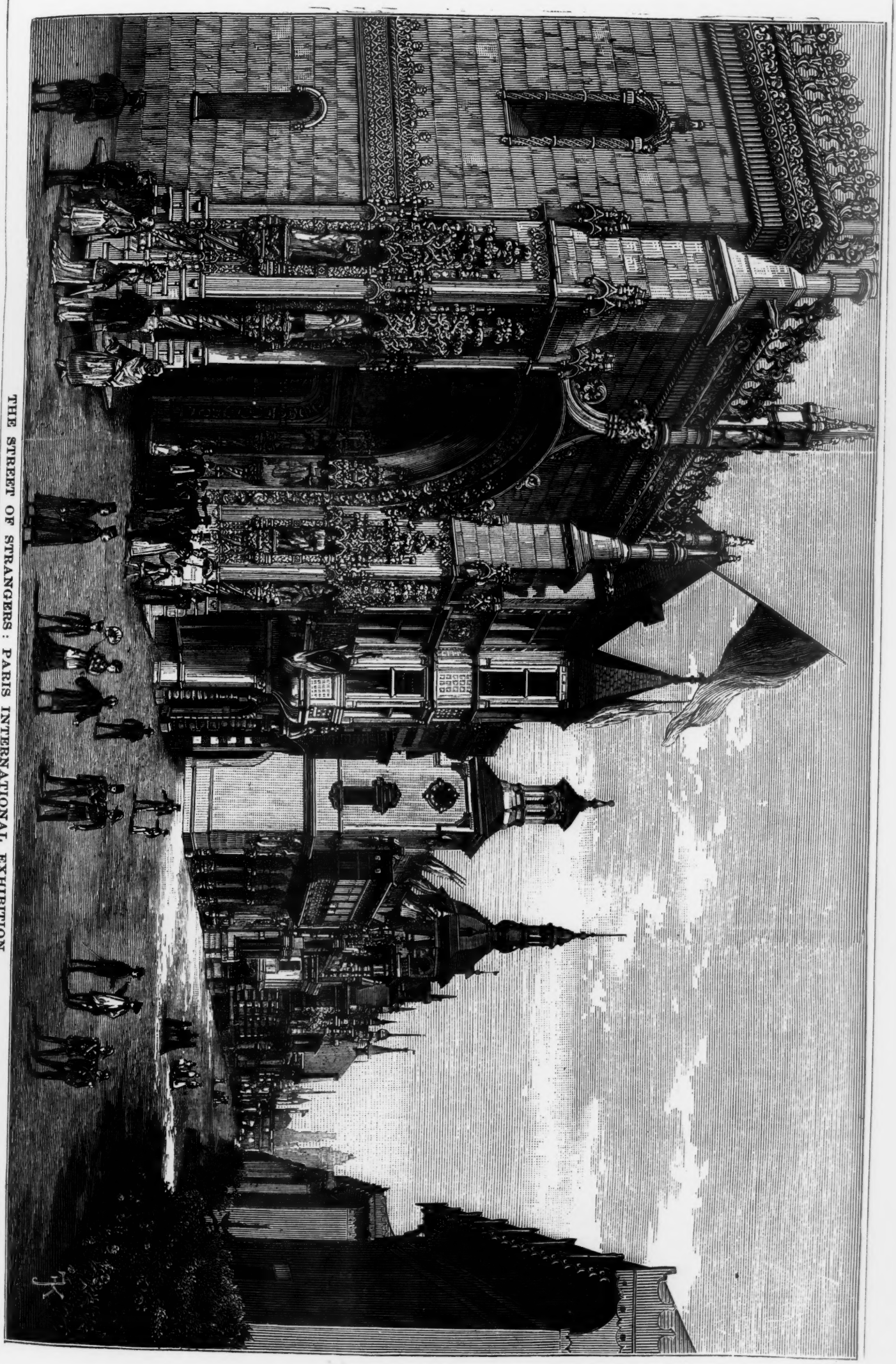
* The drawing we have engraved was made from a careful photograph, produced by M. Pierre Petit, of Paris.

PREHISTORIC STRUCTURES IN CARNARVONSHIRE.



A Fortified British Village on a Welsh Mountain Top.

Cromlech, with Cup-markings, near the Foot of Mountain.



THE STREET OF STRANGERS: PARIS INTERNATIONAL EXHIBITION.

GENERAL CONFERENCE OF ARCHITECTS, 1878.

WE this week conclude our very copious reports* of the proceedings of the Conference. In our number a fortnight ago (pp. 583-584), we printed the substance of a paper by Mr. J. Douglass Mathews, and last week (pp. 610-611), papers by Mr. Boult and Mr. Honeyman respectively, on "General Building Regulations for the United Kingdom." Last week (pp. 615-616), we printed a paper, by Dr. Phené, on "Troy and Mycenæ," which was preceded by an interesting paper on "Rude Stone Monuments," by Mr. T. Roger Smith, both these papers being discussed together. It only remains for us to give a report of the discussion on the papers "On General Building Regulations," the substance of Mr. Roger Smith's paper, and a report of the discussion on it, and on Dr. Phené's paper.

GENERAL BUILDING REGULATIONS FOR THE UNITED KINGDOM.

In the discussion which followed upon the reading of Messrs. Mathews's, Boult's, and Honeyman's papers,

Mr. T. Chatfeild Clarke, in moving a vote of thanks to the authors, said Mr. Mathews's paper appeared to be a most careful analysis of the model bye-laws. Mr. Boult's paper also contained several valuable suggestions; and with regard to Mr. Honeyman's paper, and especially its last point, it was desirable that the Conference should be reminded that in the Buildings Act Amendment Bill now before Parliament, there was a clause under which arrangements were to be made that in future, bye-laws adopted by local authorities shall be submitted for examination to the Institute of Architects and the Institution of Surveyors, by whom they would have to be approved before being sanctioned by the Local Government Board. That concession was the result of a suggestion thrown out by Mr. Honeyman. It was a very important point gained, and it had been, he believed, most graciously conceded. With regard to two or three of the general questions raised in the papers, he thought that although architects ought to be, and were, as a rule, willing and desirous to afford public sanitary officers every facility for understanding their plans, it would be a fatal mistake for them ever to consent to furnish to the local authorities full copies of all plans, sections, elevations, and detail drawings. Such a requirement was not only unfair to the architect, but it was unnecessary. He had, in giving evidence before the Select Committee on the Metropolitan Buildings Bill, protested against a proposal of the kind which was contained in that Bill as drafted, and the objections to it had had such weight that that point also had been very graciously conceded,—in substance, at any rate. Such regulations would not only impose upon the professional man a great deal of unnecessary labour, without recompensing him for it, but it would also deprive him, to some extent, of the copyright of his drawings. As to another point touched upon in the papers, he very much doubted the wisdom or desirability of conferring very large dispensing powers, with regard to the requirements of an Act of Parliament, upon any body of men. He agreed that the higher in social position were the men, the higher would be the character of the local authority, and the greater safety would there be for the public interests, but to place too great a dispensing power in the hands of such bodies, and especially in the hands of the smaller ones, was not wise; in fact, it could only lead to increased difficulties and much mischief. The true policy, as it appeared to him, of building legislation, was that advocated by Mr. Boult, viz., the laying down of certain leading principles applicable to the whole kingdom, and upon the lines of which, and only in accordance with which, should buildings be permitted to be erected anywhere,—taking due care, of course, to make those leading principles sufficiently elastic to allow of bye-laws being made in conformity with them to suit peculiar requirements of locality or material. The subject was one of great interest and importance, and although it was not possible for the Conference to discuss it in detail, they might usefully indicate what should be the scope and tenour of a Building Act applicable to the whole country,—an Act which should be so framed as not to in any way fetter or discourage building speculation, provided always that due precautions were taken for the public health and safety in respect of sanitary arrangements and construction. In London, as was perfectly well known, it was exceedingly difficult to construct houses for the working classes which, while meeting all sanitary requirements, were remunerative to their builders. If all sanitary and structural requirements were attended to in buildings of that class the margin of profit was so small as to offer small inducements to capitalists. Unnecessary and vexatious requirements in a Building Act for the whole country were therefore to be deprecated, as they would have the effect of increasing the cost of workmen's dwellings especially, and lead to overcrowding and other evils.

Mr. E. B. Ellice-Clark, borough engineer of Hove, said that having for some fifteen years been a town surveyor, he could say that he had never found the least difficulty in obtaining from architects and builders complete plans and sections of all buildings erected in the towns where he had held appointments. And he would further say, that, so far as his experience and observation went, it was a gross libel upon town surveyors and other local officers to impute to them, as the last speaker seemed to do, that they made any improper use of the plans entrusted to them by architects to aid them in the discharge of their duties as public servants. The local officers were nowadays, except in a few of the smaller towns, professional men, many of them being architects, and, from personal knowledge of nearly every borough surveyor in England, he could say that he did not believe that one of them would make surreptitious or improper use of plans coming under his cognisance. As a matter of fact, in the vast majority of instances the plans were not of such great value or novelty as to be worth notice, and he felt compelled to say that the plans submitted by professional architects were not, as a rule, nearly such "workable" plans as were submitted by builders. But, that question apart, he wished to disabuse the minds of architects of the idea that some of them seemed to entertain, that local surveyors were likely to make use of their plans; they were too honourable to do anything of the sort. He thought Mr. Douglass Mathews had taken the right course in his paper, and he agreed with his conclusions, with one or two exceptions. He had gone very carefully through the Model Bye-laws issued by the Local Government Board, and had come to the conclusion that they were, as a whole, impracticable, unworkable, and inquisitorial, and he was greatly surprised to hear that any portion of them had passed through the ordeal of examination by the Royal Institute of British Architects and a kindred society, for they contained provisions which were absurd and impossible to carry out. Mr. Mathews had, no doubt, raised a very important point in laying it down as a principle that the regulation of building construction and materials should be separated from purely sanitary details and the construction and laying-out of roads and streets. There were, undoubtedly, many town surveyors who, architects by profession, were fully competent to supervise the erection of buildings of all classes; but, on the other hand, there was a large number of surveyors, more especially in the smaller towns, who had not sufficient knowledge of architectural construction and building materials to enable them to deal properly with the plans which came before them, or to supervise the buildings when being erected. But such officials, where they existed, were fast dying out or being superseded. It should be remembered, however, that the too often unjustly sneered-at local board surveyor had grown with the times, though as a recognised official he was not yet a quarter of a century old. With the exception of such large towns as Liverpool, Glasgow, Manchester, &c., there were very few towns whose sanitary and structural affairs had been under qualified supervision for more than twenty-five years. It was undoubtedly quite true that even at the present time there were many small places where the local beard "surveyor" was something between a parish beadle and a carpenter, but still the large majority of town surveyors were fully competent to deal with the subjects treated of in the Model Bye-laws. It was highly necessary that in such large towns as Liverpool, buildings should be under the control of a separate department. There must surely be enough work, in Liverpool alone, to occupy the full attention of eight or ten official building surveyors. Whatever the cost, it was to the public interest that bad and unhealthy building should be prevented. The full and complete supervision which was necessary would find honourable and not badly-paid employment for a number of architects. He did not think that the Model Bye-laws, as issued by the Local Government Board, would be adopted in any town. He had consulted the surveyors of a large number of towns, and, with three or four exceptions, strong disapproval had been expressed with reference to the requirements of the bye-laws, which were in some respects so stringent that local bodies would not dare to carry them out. The fact was that the people wanted educating as to structural and sanitary requirements, and until they were better educated on those points it would be impossible to carry out such a code of bye-laws as that put forth by the Local Government Board. In the South of England the people were more prepared to adopt such bye-laws than such places as Hanley, in Staffordshire, where 4½-in. party-walls were general. The provisions of the bye-laws as to the widening of streets clearly showed that the Government was attempting to effect, or to cause to be effected, public improvements at the expense of individual property-owners. Indeed, cases were conceivable, and very possible, in which a man, after complying with the requirements of the bye-laws as to setting back property pulled down for rebuilding, would only have a depth of 3 ft. for building upon. Absurdities of that kind abounded in the "model" bye-laws, and it was only reasonable to expect that the Local Government Board would have been more careful before giving its *imprimatur* to such a mass of impracticabilities. Had all the architects and borough surveyors of the country been consulted, and advantage taken of the assistance they were capable of affording, the result would have been far more satisfactory. Although, however, it was quite true that the Bye-laws went too far, in some respects further than the Metropolitan Building Act, in others they did not go far enough. One provision of the bye-laws was that no wood whatever was to be put in any party-wall, no matter how thick the wall might be. That was simply ridiculous. In the case of bressummers carrying house-fronts over shops, instead of looking at them in the proper light, and prescribing the depth of the beam according to the span and the weight of the superstructure, they simply said that in addition to whatever bearing the bressummer might have upon the party-wall, it should have an additional bearing of 4½ in. on a corbel. He did not think it would be possible to bring old buildings undergoing repairs or enlargement in the same category as new ones in respect of supervision, or, if it were possible, the difficulties and complications would be exceedingly great. There was "ample scope and verge enough" for such supervision in respect of new buildings alone, and those who knew what was going on in the suburbs of many of our towns would admit that some provisions far more moderate than those contained in the Model Bye-laws would be of great advantage. Whatever might be said in disparagement of local authorities, he thought they were improving. But, as he had before hinted, the great thing was to educate the people themselves. There were many towns which had had good bye-laws for the last twenty or thirty years, but they had made no attempt to carry them out, because the public were not educated up to them. He did not think it would be possible to frame a statute which would meet the requirements of the whole of the country, and therefore recourse must be had to bye-laws, which should be amended or renewed from time to time, as might be found desirable.

Mr. T. Roger Smith said he had never so fully appreciated the desirability of a general Building Act for the United Kingdom as he did at that moment. However, after what had been said

* See pp. 579-586, 607-616, and 624-625, *ante*.

by Mr. Ellice-Clark, who was so well acquainted with the operation of bye-laws, he thought it was quite clear that the general run of the building regulations in the Model Bye-laws were above the heads of the public, who undoubtedly wanted educating on these points. It was useless to expect that town councils and borough authorities could do much, however willing they might be, to enforce building bye-laws; and he had been somewhat reluctantly led to the conclusion that further and compulsory legislation on the subject was necessary. Of this he was quite sure, however, that any compulsory legislation on the subject would exceed rather than fall short of the stringency of the provisions of the Model Bye-laws. He had had occasion to go carefully through that portion of the Model Bye-laws which dealt with buildings, and he must say that his experience as a district surveyor did not lead him to regard them as being of such undue stringency as Mr. Ellice-Clark had suggested. Taken as a whole, he thought their requirements were reasonable, and if generally adopted people would soon get out of their bad methods of building. He was surprised to hear Mr. Ellice-Clark speak of the bye-law which prohibited the insertion of timber in party-walls as a hardship. Any one who had had much to do with old property would fully appreciate the necessity of such a provision. As a case in point, the buildings on Adelphi-terrace were a year or two ago falling to ruin, simply owing to timber having been built into the party-walls, and probably not less than 10,000*l.* had been spent in reinstatement. However thick the party-wall, timber should not be built in it. If ever a Building Act were passed for the entire kingdom, the less minute its regulations the more likely was it to be efficient and workable. The more it dealt in broad, general principles, the more it confined itself to laying down leading rules, avoiding *minutiæ*, the better would it be. That such an Act was wanted was proved by the speech of the last speaker.

Mr. Douglas, of Glasgow, said that in that town the subject was just now engaging much attention. The municipal authorities were trying to get additional powers for the Dean of Guild Court, but they had not shown their wisdom by consulting the architects and surveyors of the city. He was glad to find, however, that the Royal Institute of British Architects had been recognised and consulted by the Local Government Board as to the formulation of the Model Bye-laws. As to depositing copies of plans with local officers, architects had to do it in Glasgow, and they felt it to be a very great hardship. They had to lodge a complete set of working drawings, and for large works that entailed a very considerable expense, which was not recouped. As to the improper use likely to be made of drawings so deposited, it was not always possible to obtain legal proof of an offence, even though there were no doubt as to its perpetration.

Mr. Lynam, borough surveyor, Stoke-on-Trent, said that for something like twenty years he had occupied the position of town surveyor, and for about half that period he had been in the habit of receiving plans from architects and builders who submitted them for examination; but he could not in any way endorse Mr. Ellice-Clark's remark that the plans which were submitted by builders were more practical and understandable than those submitted by architects. On the contrary, it was his experience that builders' plans were, as a rule, very imperfect and unsatisfactory, and it was often utterly impossible to make them out at all. He thought Mr. Ellice-Clark was under a misapprehension when he said that the bye-laws compelled private property-owners to give up their land for public improvements without compensation, because, although the bye-laws compelled the setting-back of property when rebuilding, there was no bye-law that he knew of which compelled the property-owner to surrender the land; he could still fence it in or enclose it. He, as an old town surveyor, agreed with Mr. Roger Smith in thinking that the model bye-laws, as a whole, were not unworthy of adoption, but he could not see his way clear to speak in favour of a general Building Act for the country at large. It might be inferred from Mr. Ellice-Clark's observations that building bye-laws were exceptionally difficult to carry out in the Potteries, but such was not the case.

Mr. Matthew Allen said he had had many years' experience as a practical builder, and he quite agreed with the advisability and, indeed, absolute necessity, of excluding timber from all walls, whether "party" or external. He had, to clear the site for some large blocks of workmen's dwellings he had erected, pulled down a great deal of small property in the neighbourhood of Finsbury, and he found the timber embedded in the walls to be completely rotten, and the walls were rendered unsafe. What else could possibly be expected, when the timber was floating in the docks to-day, and cut up and put into the walls to-morrow? From the very moment that the timber was embedded in the walls, decay commenced. For his part, he would have no wood at all in the carcass of a house. Why not, for joists, use T-iron bedded in concrete? and why not, for lintels, use concrete? It would be a very great advantage, and one well worthy of the support of architects, if in any future Building Act there could be inserted a provision prohibiting altogether the use of wood in the carcasses of houses. As to drainage, he thought it ought never to be carried under houses. He had read through the Model Bye-laws, and, speaking as a practical builder, he could not see anything very objectionable in them. They went too far on some points, and not far enough on others.

Mr. John Hebb (Assistant Architect, Metropolitan Board of Works) said he thought Mr. Ellice-Clark had somewhat misapprehended Mr. Chatfeild Clarke's remarks in objection to that portion of the Model Bye-laws which provided for the depositing of plans with local officers. He was quite sure that Mr. Chatfeild Clarke had no intention of aspersing such a respectable body of men as the borough surveyors of England. It was not to be supposed for one moment that those gentlemen themselves would make any improper use of the drawings submitted to them. What was felt, however, was that the requirement was unreasonable and unnecessary, and was likely to lead to abuses. Architects' drawings deposited at public offices passed through many persons' hands, and were in some cases liable to be "hawked about" and perhaps copied. As to Mr. Ellice-Clark's general remarks, he (Mr. Hebb) felt that so far as his experience went he could not admit that the requirements of the Metropolitan Building Act were too stringent. On the contrary, he thought they were too lax in many respects, and it was much to be desired that they should be made more stringent. It was impossible to discuss the Model Bye-Laws in detail at that Conference,—that could better be done in the committee-room,—but with regard to the general principles which should underlie the making of bye-laws, he thought they should be as few and as simple as possible. He also agreed in thinking that there should be the smallest amount of dispensing power in the hands of the administering body. One of the greatest difficulties with regard to the administration of the Metropolitan Building Act arose from the dispensing powers which had been given to the body charged with its enforcement. There was a great tendency to strain those powers, sometimes unduly. It would very much strengthen the hands of officers charged with the administration of Building Acts if there were no dispensing powers,—in other words, if the requirements of the Act were absolute. He was surprised to hear Mr. Ellice-Clark defend the practice of embedding timber in walls, for it was a continual source of failure in buildings, as all district surveyors knew full well. On the whole, it could hardly be said that the Model Bye-laws erred on the side of excessive stringency.

Mr. Carroll, of Dublin, said he was not quite sure whether it was intended that the Model Bye-laws should apply to Ireland, but if such was the intention, they would require certain modifications in many points in order to be reconcileable with the modes and requirements of building and with the materials available. In Dublin, nearly all foundations were of stone, and therefore it would be necessary to materially alter the dimensions laid down in the Model Bye-laws for foundations.

Mr. Arthur Cates said that many of the speakers appeared to be under the erroneous impression that the Model Bye-laws as issued by the Local Government Board were to be taken to include the entire wishes of the Board and its advisers with respect to building and sanitary regulations. It should be borne in mind that the Model Bye-laws had been prepared under considerable difficulties and restrictions. It would have been useless, and foolish to boot, for the Board to have issued bye-laws which would be inapplicable or *ultra vires*. The bye-laws as issued had been prepared under the 157th section of the Public Health Act, but it so happened that the powers conferred by that section were not so extensive as could be wished for the purpose of framing a code of bye-laws which should be complete and capable of general application. The Board had endeavoured to make the bye-laws as perfect as existing statutory powers would allow, and of course if the statutes could be extended and improved the bye-laws could also be made more thorough and satisfactory. It was matter for consideration whether the Local Government Board ought not to be entrusted by Parliament with more extended powers with reference to the authorisation and confirmation of bye-laws. He regarded the Model Bye-laws as a first step towards the attainment of a general Building Act, whether framed on the broad general lines suggested by some of the speakers, or whether more in detail. The Local Government Board had neither the intention nor the power of compelling the adoption of the Model Bye-laws, as they now stood, either as a whole or in part; they merely put them forward as a hint or guide to local authorities as to the points to be attended to in the framing of building and sanitary bye-laws, and there was no doubt whatever that in that way they would be of very considerable value. They were already being considered and adopted in various parts of the country, and could not fail to do a great deal in clearing the way for improved sanitary and building legislation applicable throughout the country.

Mr. Charles Fowler said that Mr. Cates had rightly defended the Model Bye-laws as being framed under very limited powers. It had been assumed by one of the speakers that the imperfection of the bye-laws, in some respects, was a thing for which the Institute was partially responsible; but that was not the case. The Institute had recommended a great number of improvements, and many of their suggestions had been adopted, while others were rejected for want of statutory power, and partly for reasons unknown to the Institute. It must be admitted, therefore, that the Model Bye-laws were not so perfect as architects could wish them to be. He had been astonished to hear Mr. Ellice-Clark, as the Local Board surveyor of an important town, express his opinion that the bye-laws were impracticable, on account of their alleged excessive stringency. The Institute committee charged with the consideration of the draft of the Model Bye-laws obtained a great deal of information from architects and local officers in various parts of the country, and they found the widest diversities in the requirements of local bye-laws, even in contiguous districts, and there was a remarkable concurrence of professional testimony in favour of something like uniformity and consistency as to general principles.

Mr. T. H. Watson said that while he was in favour of the limitation of dispensing powers in the administration of Building Acts and local bye-laws, he was not prepared to say that such dispensing powers should be altogether abolished; but whatever dispensing powers were retained might with advantage be taken out of the hands of the elective body.

The Chairman (Mr. Whichcord), in putting the vote of thanks, summed up the discussion, and said he thought the papers read had elicited some good practical observations on the subject, which might, he thought, be again brought up for consideration at the next Conference. Mr. Cates had admirably explained the *raison d'être* of the Model Bye-laws, with which, as issued to the public, many suggestions made by the Institute had been incorporated. Although nominally made by the Institute, however, those recommendations embodied the general opinions of architects throughout the country. He entirely agreed with those speakers who advocated the reduction of the dispensing powers of elective authorities to the narrowest possible limits. At the same time, he did not see the practicability of abolishing dispensing powers altogether, for building was conducted under such varying circumstances that an absolutely rigid and fixed code of rules would be unworkable in all cases, except at great sacrifice. It was satisfactory to know that, in the Buildings Act Amendment Bill now before Parliament, the Metropolitan Board of Works had taken powers to make bye-laws which should clearly define what sites might be built upon, and in what cases concrete was to be laid over the site. Hitherto speculating builders had been allowed, without let or hindrance, to build houses on mud-shoots and all kinds of abomina-

tion. He agreed with all that had been said in condemnation of the practice of inserting timber in party or external walls. It had been incidentally suggested during the discussion that Model Bye-laws should, if possible, be framed bearing upon the vexed questions which arose as to light and air. Such questions were a source of abundant litigation and expense, and it would be very desirable for the Institute to direct its attention to the subject, with the view of seeing whether it were practicable to suggest any guiding rules or principles which might be of assistance in such matters. While the objections which had been made to the depositing of unnecessary plans were very cogent, it should at the same time be remembered that great inconvenience had arisen from the fact that under the Metropolitan Building Act there was no power to interfere with the internal construction of a house.

The vote of thanks having been carried by acclamation, Mr. Douglass Mathews briefly replied, and the meeting ended.

RUDE STONE MONUMENTS.

The following is the substance of Mr. T. Roger Smith's paper, already referred to :—

The nineteenth century will be remarkable for nothing so much as for the extension of our knowledge, it has overstepped boundaries which once seemed final; and among other extensions of our powers we for the first time possess the means of going back beyond the boundary which hitherto limited our knowledge of the past. Till lately our utmost range backward was reached when we came to the earliest written inscriptions and books. We are striving to extend our retrospect into pre-historic life, which, now for the first time systematically understood, forms a chapter of the deepest interest in that new volume, if I may so term it, of the book of knowledge which modern research is placing within our reach. If I here for a moment linger over that which has come to light concerning prehistoric men and their ways, it must be distinctly understood that I do not wish to imply that the structures we are to consider belong to any special prehistoric age. . . . .

Mr. Fergusson has divided the objects which he includes under the general name which stands at the head of this paper into five groups :—Tumuli, that is, mounds; (2) Dolmens, that is to say, table-stones, popularly but incorrectly called cromlechs; (3) Circles; (4) Avenues; (5) Menhirs, that is to say, standing stones; and I propose to follow his divisions, but to dwell chiefly on what I have been able to see myself, and on objects of which, thanks to the kindness of Sir Henry Dryden, Professor Hayter Lewis, Mr. Payne, Mr. Blashill, and other friends, I am able to offer you some illustrations.

The simplest monuments actually made of rude stone which present themselves are the small stone mounds, or tumuli, often called cairns. On the summits of the Welsh hills they are to be found in numbers; they are there perfectly circular, of considerable size, of a regular conical shape, though not very steep, and they often possess a well-marked cup-like depression, like a crater, at the summit. They are to be found also in many parts of Great Britain, especially in those localities which are naturally a little difficult of access. In some cases cairns and mounds must have been intended to serve some other purpose than that of ordinary sepulchres, as many of them are of enormous size, and must have consequently commemorated either the burial of our great men or of a large number of people, or some great event. In Wiltshire there stands what, I believe, is the largest of these mounds which Great Britain contains; it is called Silbury Hill. It is circular, and, according to Mr. Fergusson, no less than 552 ft. in diameter at its base. It rises with a regular well-formed slope to a height of 130 ft., and has a flat top 100 ft. in diameter. Nothing can well be more striking than this magnificent mound, which commemorates we know not what, but seems certainly to have been a memorial or monument of something or some one. Excavations have been made in it, but no discovery of human remains is recorded. When I said that Silbury Hill was the largest of these mounds in England, I ought perhaps to have said the largest untouched one, for in several instances they were occupied during our troublous historic times as good spots on which to build a castle. Basing House, near Basingstoke, for example, stood upon an ancient British mound. It has even been suggested that the vast mound now crowned by the great round tower at Windsor Castle was another. The more moderate-sized cairns have frequently proved more really worth examination than the very large ones. Often, on opening them, some sort of stone chamber, often termed a cist, has been found, constructed more or less rudely, in the very heart of the cairn, and whether such a chamber existed or no, some relic or other generally repays the explorer.

The next remains are dolmens. These seem to be closely allied to the stone chambers in the heart of the cairns just alluded to. A dolmen in Gaelic (or in the ancient Bréton tongue, which is closely allied to Gaelic) means table-stone. Such a structure always has a flat stone at the top, and this is supported sometimes by three upright stones, standing well apart, and sometimes by three or more flat stones forming the sides and end or ends of a chamber. A dolmen is sometimes prolonged, forming an oblong chamber, and sometimes has a passage, walled and roofed in stone, as an access to it. One in which a man can stand upright is a very large one; and yet, from the enormous thickness and bulk of the masses of stone used in its construction, a dolmen with a chamber of very moderate size is a most impressive and dignified structure. Many dolmens are buried in mounds of stone or earth, others are perfectly visible at the present day, and it is a matter on which antiquaries are not agreed whether these last were not covered with mounds, or, at any rate, were not formed with the intention of being so covered. I do not know that this very much matters for my purpose. What I want to point out is that these unknown constructors, who may not have cared so much as we do for the artistic effect of their works, raising structures where they had the advantage of the natural forms of unhewn stone, and constructing them as solidly as they knew how, put into them a perfectly lavish expenditure of labour, and an enormous excess of strength, and doing so, have accomplished what few trained architects have even approached. They have produced works the appearance of which have a solemnity, a dignity, and a power almost, if not quite, as touching and as impressive as the grandeur of the finest natural rocks or caves. Dolmens are not unknown in this country. There is, for example, one not far from Maidstone, known as Kitt's Cotty House. There are several fine ones in Anglesea, and there are many in various parts of England, Wales, Scotland, and Ireland; but, to see them at their best, you must cross the Channel, and traverse the north-western corner of France, reaching the wild south-western coast of Brittany, just north of the mouths of the river Loire. Here you are in the district called the Morbihan, and I shall, in describing what is there to be seen, ask permission to make use of some notes written by me during my visit there, as, althongh they have seen the light before, they are more likely to be graphic than anything I could now write :—

"The Morbihan is an unfamiliar name in England, and the Department of France which bears that name, and which forms the south-eastern portion of Brittany, does not lie in either of the routes ordinarily taken by the bulk of English travellers in France, yet it possesses attractions of no ordinary description, being famous amongst antiquaries for possessing what Mr. Fergusson describes, and with justice, as 'the most remarkable group of megalithic remains not only in France, but perhaps in the whole world.' Names in the Morbihan are all striking; they are all derived from the ancient tongue of Brittany, and fall upon the ear with a very uncouth ring. Karnac, Lochmariaker, Plouharnel, Quiberon, have an unmistakably different ring from the ordinary titles of French towns and districts, and one which harmonises well with the unspeakable strangeness of the objects which await the traveller. The air is pure, the country picturesque, and the seaside life of the fisher folk must still retain not a few of the aspects presented by the ways of those far remote people who raised the stones and carved the undecipherable emblems which have lasted so long and are so full of mystery.

The number of these stone chambers in the district is very large, so much so that in the course of a single day, much of which was taken up in other ways, nearly twenty were visited by me. Usually the chamber is large enough to stand upright in without difficulty, and is roofed by one enormous slab of granite; the entrance passage, where that feature occurs is not so high as the chamber, and in many instances it is necessary to crawl on hands and knees in order to explore it.

Near Erdeven a group of three dolmens exists, all of which are enclosed in one monnd of earth; and when, some years ago, these were first opened, many curious objects were found such as axe-heads (celts) in fine hard stone, and ornamented in gold. Many of these objects are still preserved in the best room of a little village inn on the roadside hard by. These remains lie thickest about the peninsula of Quiberon, a rocky tongue of land, which lends its uncouth name to a bay of some size, crowded with islets large and small, very favourable to the cultivation of oysters, and so furnishing plenty of occupation to the hardy fisher-people who live in the village, or are scattered about here and there in sheltered nooks. On crossing this peninsula from its western side near the village of Karnac to Lochmariaker on its eastern shore, a singular variation in the dolmens is discernible. At Karnac there is hardly a dolmen upon which any sculpture can be discerned; but at Lochmariaker, less than ten miles distant, it is constantly met with. The finest of these sculptured dolmens is situated on an island a mile or so east of Lochmariaker, known as the Goat Island, or, in Bréton, Gave Innis.

The dolmen is under an enormous mound of stones. It is totally dark within, and is under the charge of a guardian, who provides a light, and has the key of a rude door, which has—perhaps prudently—been fitted to its entrance. On passing this door we find ourselves at once in a straight passage rather more than 40 ft. long, and about 5 ft. wide, terminating in a chamber about 8 ft. square. Both the passage and the chamber are formed of granite slabs, and roofed with the same material, the chamber being almost entirely covered by one single stone of enormous size. The passage is high enough to stand upright in, and the chamber is higher; in both cases the roof is of plain stone, and nearly level. The great wonder of the place, however, lies not so much in its size, or the largeness of the blocks employed in its construction, as in the sculpture which covers its sides. From entrance to chamber every stone on both sides is carved, and most of the stones are completely covered with carving. The objects represented are few; that is to say, there is but little of the sculpture which can be recognised as representing things with which we are familiar. A few celts, *i.e.*, axe-heads, are very distinctly visible on one of the slabs, and a very fairly distinct representation of serpents is found on another; while a third appeared to me to bear what was intended as a somewhat conventionalised lily, both flower and leaves being tolerably distinct.

The bulk of the decoration is, however, made up of curling lines; circles within circles meandering over the whole surface, and executed in firm, bold, channelled lines of considerable breadth and depth, and in fairly true curves. The marks conveyed to my mind the impression that they must have been laboriously produced by some scratching operation, and not with tools in any way analogous to a chisel and hammer. Without pretending to say that the resemblance is close, there is an aspect about the whole sculptured wall, especially when looked at rather in the mass than in detail, which recalls the sea. Nothing could well be more probable than that these coast people building this splendid structure, whether tomb or not, on a sea-girt island, should desire to imitate the waves of the ocean; and the endless succession of curves and wavy lines is perhaps quite as good a representation of them as could be expected from persons with a very rudimentary power of drawing, working on a most intractable material, and with tools that in all probability required the expenditure of immense labour to produce even a moderate result. There is, however, a veil of mystery over these objects which has not yet been lifted, and which adds not a little to the wonder and pleasure with which the visitor gazes upon a work so strange, so rich, and so solitary, buried away in the heart of a vast stony mound, heaped up by hands long since forgotten, upon the rockbound shores of this tiny islet. By whom and when, and for whom, one cannot but ask, was all this done, and what did it all mean?"

We now come to a series of remains which are essentially British, namely circles of standing stones; by this is not meant that such circles are exclusively British; but only that they are extensively numerous in this country, and that no other European examples equal the finest of our own. Stonehenge must be a familiar name to every one of us; but probably few in this room are ignorant of the fact that circles are to be met with in very many parts of England and Wales, especially in the most picturesque, or, in other words, the least accessible districts. A very famous one, known as Long Meg and her Daughters, of which Mr. Payne has kindly given me some particulars in explanation of his plan, is situated about six miles from Penrith, and about one mile from the little village of Salkeld, on a site nearly level, but sloping a little to the south-east, and with a fine view of the great moorland mountain of Cross Fell. There is only one circle of stones to be traced, the arrangement of which will be seen on the plan. The only rule in placing the stones seems to have been to place them further apart when larger, and closer when small. Here and there are stones considerably larger than the rest; these are shown by a cross on the plan, and the dimensions of some of the principal stones are also given. Circles occur of all sizes, from ten or twelve paces in diameter to about 100 ft. On the Derbyshire moors and the Welsh hills they occur constantly, and if many are famous others are little known. I have myself found a small circle of large flat stones, of which about two-thirds were still erect, while the remainder lay as they had fallen on the top of a grouse-moor near Chatsworth, in Derbyshire, and I could not find that any resident in the locality was aware of its existence. There is a fine circle of stones about 100 ft. across near Keswick; and a good example of a stone circle, though much ruined, exists on the southern slopes of Penmaenmawr, in North Wales, a mountain which also shows traces of a stone rampart, enclosing a camp at the summit, and retains several well-formed cairns,—that is, mounds of stones. Such circles consist of large stones, as a rule, of tolerably uniform size and not unfrequently flattish, set up on end, buried sufficiently in the ground to obtain a foundation, and standing a short distance apart. Very often a circular mound encloses the stone ring. In my little Chatsworth circle, which was thirteen paces,—or say 45 ft.

across,—these stones were all flat, averaging 2 ft. to 3 ft. wide, and those which remained erect stood about 3 ft. or 3 ft. 6 in. out of the ground, with the spaces between them about equal to the width of the stones themselves.

The most famous stone circle in Europe is in Wiltshire, and is familiar to persons who know nothing whatever about the numerous megalithic remains of other kinds to which it is allied. Of course I refer to Stonehenge. This fine monument strikes me as being one of the most impressive and telling structures for its size that I have ever seen. No illustration of it conveys any adequate idea of its appearance, though you may obtain a very good notion of its general arrangement from plans, photographs, and diagrams. Stonehenge stands quite alone upon a high part of Salisbury Plain, a desolate rolling kind of down with no house or tree of any sort. It was surrounded by a circular earthen mound, which, if it ever was high, has been very much washed or worn down by weather and time. This was 100 yards across. In it stood a great circle of high stones, tolerably square, and (speaking from memory) about 15 ft. high, and connected together by horizontal stones going from one to another. Within this circle was an inner and higher ring, not quite circular, but of a horse-shoe shape, formed by ten very fine lofty stones planted in five pairs, and each pair united by a stone laid across the top of both. These stone posts and lintels are worked with two cup-shaped hollows in the underside of the lintel, while two corresponding projections are formed on the ends of the uprights, and fit into them, forming tenons and mortises. There were also a considerable number of tall stones, but of less height than those described, which are of a bluish granite, and must have come from either Cornwall or Ireland. These are most of them overthrown, and of the larger and heavier ones a considerable number have fallen and strew the ground. Still a very large proportion remains standing,—grey with age, weather-worn, yet stoutly erect to testify to the great skill and energy of those unknown inhabitants of our island,—our predecessors certainly, perhaps our ancestors, who raised them. It is hardly possible to exaggerate the impressiveness of Stonehenge, and this, of course, is greatly increased by our entire want of certainty about those who raised it, and the object which they intended it to serve. I think it not at all improbable that the enclosure may have been completed by woodwork between the stones, and may have been roofed, which could not have been a difficult matter to those who could master the very great difficulty of putting up the stones. If so, it is more than possible that to us its appearance as a ruin is more impressive than the aspect it would have presented had we seen it when it was a completed building, with a large amount of timbering partly encumbering the stones; but, however this may be, its actual impressiveness can hardly be exaggerated.

There exists in the same county (Wiltshire) another monument which is more extensive, and far more ruined than Stonehenge, and which, when complete, must have been hardly less astonishing. I allude to Avebury,—very near to the large mound, which bears the name of Silbury Hill, and which has been already described.

Avebury consists of an enormous enclosure, very nearly but not quite circular, consisting of an artificial trench, outside of which is raised an enormous rampart or mound of earth. Although time, and the interference of the inhabitants,—for a village is built within the circle,—have very much damaged this rampart, enough of it remains to show that it was a surprising work, rising to a great height, and of enormous thickness, and with well-marked entrances. This earthen enclosure was about 1,200 ft., that is to say, 400 yards, or not far from a quarter of a mile across. Within this was constructed a ring, consisting, when complete, of about 100 enormous stones, but for our knowledge of which we are largely indebted to Sir Richard Colt Hoare, a distinguished antiquary, who published an account in 1812, for the farmers have between that time and this thrown down and destroyed the greater part of the stones which were erect in his day, partly as an amusement, partly to get them out of the way, and partly for cutting up into building stone. Within the great earth rampart, then, this circle of large stones was formed, and in the space so enclosed, two circles of stones, not symmetrically placed, and each more than 100 paces across, were formed. Enough of the stones which formed these is standing for us at the present day to trace them out, though their grandeur has been very much ruined.

But we have not yet done with this Avebury monument. It was approached up an avenue about 50 ft. wide and three-quarters of a mile long, and made of very large stones standing in pairs. When I say very large, I mean stones 20 ft. high, or thereabouts, and some 4 ft. square. Even in its ruin, this avenue is very impressive; and though most of the stones have disappeared, and many of those which remain have been overthrown and now lie flat, there is quite enough remaining to show that our obscure forerunners had their own ideas of dignity and impressive effect, and were quite equal to the task of carrying those ideas into effect on an enormous scale.

I am now, having been led to the subject of stone avenues by the Avebury one, going to ask you to cross the Channel with me once more and return to Brittany. Here you will encounter no circles, but stone avenues even more remarkable than the one at Avebury, and stone pillars of great size:—

"The spot which we will first visit is Karnac, a very small French country town already alluded to, a mile or so away from the Bay of Quiberon. Here is to be found the most remarkable of all the pre-historic monuments of Brittany, namely, a series of avenues of stones extending over miles of country; and, notwithstanding the attacks of time and the worse damage inflicted by human force, still in a state of admirable perfection. These avenues are not single lanes of stone, like the great one at Avebury, but are disposed side by side, and formed by rows of large stones, so arranged as to give ten or twelve parallel lines. The distances apart vary to some extent, but average about ten to twelve paces, so that where there are ten avenues the width of the monument is something more than 100 yards. Three such series of stones succeed each other, extending in a curved line over a space not less than two miles, and in each case beginning with stones of moderate size and somewhat irregular spacing, and proceeding to larger and more evenly placed stones, and on to still larger ones, until the series ends with a row of very large stones indeed (as much as 20 ft. high each), very evenly ranged. Towards the head of each series the avenues are strongly marked, perfectly regular, and in many places so well set out that the stones give true lines when looking either directly across or diagonally over the group, as well as when looking back from the head of the series towards the beginning.

It is impossible to convey to those who have not seen the thing itself anything more than a very meagre conception of the arrangement of these stones, while to give any notion of their solemn, wild, unearthly, impressive dignity, standing alone, grey and weather-beaten, on an open breezy heath, is simply impossible. The first series of avenues, called the lines of Kerlescant, run almost true east and west, though their lines suffer a slight bend. Where they end occurs an open space of considerable size, now partly occupied by a fine plantation. This has been enclosed by a mound on the north, and by very large flat stones, placed on edge and close together on the other three sides; and of these, perhaps one-fifth are standing to the present day. Thus, when complete, the arrangement of this part of the monument was that the parallel avenues should lead up to a large enclosure of square shape, dominated by a mound.

Proceeding farther towards the west, an interval of perhaps 500 paces separates the enclosure just referred to from the beginning of the second series of large stones. In this interval no stones occur, but when we have passed it we begin to recognise the commencement, at first not very distinct, of a new series of avenues. These, after a short time, become once more unmistakably traceable; but this time they run in a direction about south-west. As before, the regularity of arrangement grows to be more marked, and the average size of the stones is greater as we proceed along the monument; we finally reach still larger stones, and when we come to the front it is formed of fine upright blocks of granite (the material of the district) spaced and ranged with much precision.

If there ever was a stone enclosure here, most of the traces of it have been removed, but there are several stone buildings forming the hamlet of Kermario, and, including a mill hard by and the thin stones which would have been used to form an enclosure had there been one, may have served as a quarry. This is, however, a mere conjecture; certain it is that the principal object now visible is a half-ruined stone dolmen of great size.

Again an unoccupied space has to be traversed, and by-and-by a third series of stones is begun. This, like the Kermario lines, of which it is a direct continuation, runs in a south-westerly direction, and it continues till near its front the finest and largest stones in the whole series are met with: the front line includes several magnificent monoliths, certainly approaching 20 ft. in height. The termination of this third series of avenues was an enclosure, similar in position and construction to the one at Kerlescant, but which had, as far as can be made out, almost a semicircular shape on plan, the chord of the semicircle forming the face of the avenue. A hamlet named Maenac has, however, been so built that many parts of this enclosure are interfered with, and it is only with difficulty that it can be made out.

Mr. Fergusson's theory is, that these stones are a memorial of some great military triumph, and represent an army on the march and an army in order of battle; but others feel that the constructors of these astonishing structures appear to have had an idea identical with that which the ancient Egyptians developed so grandly, and by the aid of appliances evidently quite unknown to the rude architects of this megalithic monument. An avenue of permanent objects has been employed in both cases to lead up to a sacred enclosure; and it seems as if, in the absence of any other power of adding to the dignity of the objects of which the avenue was composed, those ancient people had determined to gain nobility by increasing the number of avenues.

At a distance of some two miles and a half north-west of the Karnac monument stands the similar one of Erdeven, and the whole intervening space bristles with large stones and dolmens, sufficient at any rate to show that the entire region was one where the inhabitants desired to establish memorials, even if the intervening stones were not intended in some way to link the two monuments together. In the Erdeven monument, we have a series of avenues formed by ten to twelve lines of stones, running nearly due east and west, and extending about a mile. The lines in this enormous monument are weakest near the centre,—that is to say, the stones there are the smallest and the spacing least regular. They are distinctly marked as they approach the east and west ends, and are terminated at the west by a series of very fine stones. The monument is not, however, so striking as those at Karnac: it has been more interferred with by cultivation and by the destruction of the stones of which it is composed, and if it led to any enclosure at either one end or the other, there seem now few traces, if any, of such an object. Two or three isolated groups of large stones stand in its neighbourhood, and if a clue is ever found to the arrangement and intention of the whole, these groups must be taken into account.

One other description of rude stone monuments is found in Brittany, namely, an isolated standing stone. To this is given the Bréton name of Menhir; and were it not that the grouped stones in this district are so interesting as to eclipse all other objects, there are sufficient solitary menhirs in the neighbourhood of Karnac and Lochmariaker to attract the antiquary. One such stone, at least, must not be omitted from a notice, however hurried, of the wonders of the Morbihan,—a stone which one cannot look upon without astonishment, even although it is now prostrate and broken into three pieces. It lies in the outskirts of the hamlet of Lochmariaker. When whole, this menhir must have exceeded 60 ft. in height by about 12 ft. across,—that is to say, it was nearly as high as Cleopatra's Needle and more bulky, so that it was quite as unwieldy and probably quite as heavy; and if we consider what a feat it is for people who can command iron tools, steam engines, and all modern mechanical aids to quarry, transport, and, above all, to set up an obelisk of this size, we cannot but be filled with wonder when we behold this mass, which the unknown forerunners of the present fisher people must undoubtedly have prepared and transported to its site and set up."

In bringing these remarks to a close, I have to confess that I am perfectly aware that they present only glimpses at a great subject, and give a fragmentary and imperfect account of what might have been much more systematically put before you. But I have confined myself almost entirely to what I have actually seen, and have mentioned nothing which is not easily and pleasantly within reach of you all. The object of this paper is by no means to tell all that is known about rude stone monuments, still less to involve you in archæological discussions, but to describe a few of the most imposing specimens, and especially to show that they possess qualities which make them well worthy the attentive study of architects. There is probably no building of the same dimensions so impressive as Stonehenge, and it would be hard to conceive of any mode of making use of great space to such advantage as at Karnac.

We cannot take leave of these monuments, and especially of the noble ones remaining in our own islands, without feeling some pride in the work of those far-off people, whoever they were, and whenever they lived, who once had as much right as we now have to call these western lands their own. It is not a little pathetic thus to interrogate memorials which have been struck dumb by lapse of time, tombs of we know not whom, memorials to commemorate we know not what. But yet living in the full glare and busy rush of a civilisation which, if enlightened and advanced, is not the less tumultuous and distracting, it is almost refreshing to cast our eyes back into the darkness of the far-off past, and to try to fancy who and what the men were who did such astonishing works; and I am not without the belief that, if we realise how well they did this work, it may prove instructive also.

In the discussion which ensued,

Professor T. Hayter Lewis said that Mr. Roger Smith had so thoroughly gone into the subject, bearing in mind the brief period available for the reading of a paper, that there was not much to be said in the way of discussion. The study of rude stone monuments, though not strictly architectural, was one that was capable of investing large portions of English and Welsh scenery with an interest over and above that due to natural beauty or romantic situation. The eye of the student of such remains would be able to read the landscape in a way that would be impossible to those who had paid no attention to the subject. What to ordinary observers were merely so much heather and heaps of sandstone had a story, however vague it might be, to tell to the student of ancient remains. On Dartmoor, for instance, were to be found remains of "beehive huts" and other indications of man's residence there at a very remote period, and amongst the Welsh hills, on Penmaenmawr, were to be seen the remains of one of the finest pieces of British fortification extant, and the surrounding hills were covered with Druidical remains of all kinds. As to the date of these remains, Palgrave, in his interesting and extremely valuable work on "Arabia," had spoken of them, in a phrase which had now become almost idiomatic, as records of "the speechless past," and as that was so, it was not possible to speak confidently as to their age. There was

scarcely a piece of carving or ornamentation, however rude, nor anything of any character in them, to give the least clue to their age, or to the men who reared them. Where anything that could fairly be called inscriptions or carving were to be found, they were so imperfectly understood as to be of no assistance to the inquirer. In Sardinia, in Wales, in whatever part of the world these remains were found, they were ever "speechless." Sometimes it was possible to obtain some information, if only of a negative kind, from a thorough examination of the site. As an example, Professor Lewis cited the case of Avebury, in Wiltshire, where a Roman road traversed the plain and ran almost close up to the large mound known as Silbury Hill. Controversy at one time arose between antiquaries as to whether the hill was pre-Roman or of subsequent date to the construction of the undoubtedly Roman road. The site was excavated, and it was found that the Roman road ran round the hill. The supporters of the pre-Roman theory of the origin of the hill held this to be conclusive proof of the correctness of their views; but, on the other hand, those who believed that the hill was thrown up subsequently to the formation of the Roman road contended that the site of the hill was originally a marsh, over which the Romans would not carry their road, but diverted it and carried it round the margin of the morass which was now covered by the hill. This was only one example of the difficulties which would present themselves in the effort to find out the date of these old remains. A striking point in connexion with the subject was the singular resemblance or "family likeness" which such remains in all parts of the world bore to each other. That they must date from a very remote period indeed was proved by the utter desolateness of some of the lands in which they were found. Palgrave, in his work on "Arabia" before mentioned, said that in one place he came upon a circle of stones formed of trilithons so large as to remind him of Stonehenge, which they so strikingly resembled that it was difficult for him to realise that he was not on Salisbury Plain. He had also found many works in the neighbourhood of the Red Sea, which were curiously similar to those existing in Britain. It was certainly open to doubt whether some antiquaries were correct in their inclination to assign a comparatively modern origin to these remains. For his (the speaker's) own part, he was inclined to think they were incorrect. As to the uses to which these masses of stone were devoted, he thought there was no doubt that numbers of them, such as L'Ancresse, in Guernsey, were of sepulchral origin; but in others, such as Kit's Coty House, in Kent, he did not see how that could possibly have been the case; it might perhaps have been an altar or a *bema*. With reference to Dr. Phené's paper on Mycenæ, it was many years since he (the speaker) was at Mycenæ; but no place he had ever visited had been more interesting. Ever since his visit, he had for years prior to Dr. Schliemann's splendid discoveries suggested to his students, in the course of his lectures, that if they ever had the opportunity to go exploring, the place where they might hope to be successful was Mycenæ, from the fact that the remains were known to have been left untouched, and that whatever was buried in the ruin of the Treasury of Atreus would probably be found there still. This had proved to be the case, just as the Germans had found such priceless treasures at Olympia. With respect to the theory of Dr. Forchhammer, he concurred with Dr. Phené in thinking that it could not be possible that the discovered treasures were Persian. In conclusion, he moved a vote of thanks to Mr. Roger Smith and Dr. Phené for their able and interesting papers.

Mr. J. T. Wood, in seconding the motion, said that, alluding to the cairns and mounds found amongst the Welsh hills, Mr. Roger Smith had spoken of the existence in them of crater-like depressions. A fairly flat portion of the hill-side was chosen as the site of these structures, and a circle of cut stones had been first of all built in order to form a pedestal from which was to rise the pyramidal pile of loose stones. In examining some of these remains, he found that they had been despoiled by the removal of some of the stones from the apices and casting them down the sides, and he had discovered one of the crowning stones of a mound lying under a heap of uncut stones.

Mr. W. F. Potter said, that some years ago he was in Cornwall, where he examined most of the so-called "cromlechs" and Druidical stones, and subsequently he visited Stonehenge. He was greatly struck at the vast difference between the character of the work at Stonehenge and that of the so-called "cromlechs," or Druidical stones. Stonehenge appeared to him to be the work of a highly civilised people, for the excellence of the workmanship was evident to this day, the marks of the masons' tools and the sharpness of the arrises still remaining. Another specially distinguishing characteristic of Stonehenge was the largeness of the stones. On the other hand, some of the Cornish remains seemed to be imitations, by a barbarous people, of the work at Stonehenge. In connexion with the subject, Mr. Potter alluded to an interesting article which appeared in the April part of *Chambers's Journal*, on "Lundy Island."

Dr. Phené offered a few remarks on Mr. Roger Smith's paper, and upon the drawings exhibited. He observed that, for several years past, he had now regularly devoted some portion of his time to Brittany, which was a most interesting field for the student of rude stone monuments.

Mr. R. E. Pownall having made a few remarks,

Mr. Phené Spiers spoke in support of the vote of thanks, in which he wished to include the names of Sir Henry Dryden, bart., and Mr. Simpson, for their kindness in sending the drawings exhibited on the walls.

The Chairman (Mr. Bowes A. Paice) then put the vote of thanks, which was carried by acclamation.

Mr. Roger Smith, in reply, expressed his gratification at the amount of discussion the subject had received. Professor Lewis, in his interesting speech, had entered upon the vexed question of the date of these remains, and Dr. Phené and other speakers had touched upon the question as to how far some prehistoric monuments had been artificially shaped, and how far they owed their appearance and contour to the hand of Nature. The latter was a point as to which he found it very difficult to come to a conclusion, even in sight of the remains themselves. With regard to Mr. Wood's question, his (Mr. Smith's) opinion was that the depressions which he noticed as existing in a considerable number of mounds or hills in the neighbourhood of Penmaenmawr could hardly have been caused merely by the rifling or spoliation of the mounds, for the bottoms of the depressions were very evenly formed, the indentations being saucer-like in form, and so extremely sharp and clear in their outline that they hardly appeared to have been touched since the day they were formed. His impression was that these depressions might have been used as places in which to light fires for funeral pyres, beacons, or other purposes. With regard to menhirs, the point raised by Dr. Phené was a most interesting one, and he hoped the Association would ask him to read a paper on those prehistoric remains, as the idea as to their being beacons was one very well worthy of consideration. As to the avenue at Karnak, the question as to what it might once have been belonged to the region of speculative discussion, and therefore he would not enter into it, although he hardly coincided with Dr. Phené's views on the subject.

Dr. Phené briefly acknowledged the vote of thanks, and thus concluded the Fifth General Conference of Architects.

WINTER GARDENS, BLACKPOOL.

THE Blackpool Winter Gardens are approaching completion, and will be opened on the 1st of July. The site upon which the buildings have been erected consists (according to the *Blackpool Gazette*) of an irregularly-shaped plot of land, with about twenty corners, and abuts upon Leopold-grove, Adelaide-street, Victoria-street, Oak-street, Adelphi-street, and Church-street. In the instructions to architects the directors stipulated that provision should be made for a promenade not less than 200 yards in length, by 30 ft. in width, and also for a concert-hall or pavilion capable of accommodating about 3,000 persons, and that the large house on the grounds should be utilised if possible. The main building is a large concert-hall, or pavilion and promenade combined. The concert-room is 133 ft. 6 in. by 72 ft. 3 in., and is placed concentrically with and within the promenade. It will, it is calculated, comfortably seat 3,000 persons. With a view to requirements in the future, the orchestra has been so constructed as to be made into a stage, so that if, by-and-by, the management see fit to give theatrical performances, a very short time and a very little trouble will fit up a stage from 30 ft. to 35 ft. deep, with all the necessary dressing-rooms and accommodation. Outside the concert-room, and encircling it, is a promenade with a glass circular roof, the floor of which is about 3 ft. higher than the floor of the concert-hall. This promenade is 30 ft. wide, and is separated from the concert-room by a sort of wooden portcullis, or sliding sash, something after the manner in which the concert-room at the Crystal Palace, Sydenham, is divided off from the nave. The object of this is to enable the whole to be thrown into one great concert-room, should occasion require it to be done. In this way from 6,000 to 7,000 persons can be provided for. This promenade is provided with plenty of statuary, ferns, palm-trees, &c. From one corner of this walk there is an entrance to the covered skating-rink, a building of glass and iron, 135 ft. by 88 ft. This adjoins the open-air rink, and with it will give an area of about 35,000 square feet, open and covered, for skating purposes. The covered portion is so constructed that it can be used for other purposes, such as a smaller concert-room. The architect of the building is Mr. Mitchell. The main building is of brick, relieved with stone dressings and terra-cotta.

The following contractors have been engaged upon the work:—Messrs. Cardwell & Sutcliffe, brickwork; Messrs. Fielding & Sons, masonry; Messrs. Curwen & Swain, Limited, joinery; Messrs. Laidlaw, Son, & Caine, ironfoundry; Messrs. Whiteside & Walmsley, plastering; the Val de Travers Company, asphalte; Messrs. Braby & Co., Limited, zinc work; Messrs. Minton, Hollins, & Co., tiles; Coalbrook Dale Company, fountains; Messrs. Edmondson & Co., stained glass; Mr. W. E. Rendle, patent glazing; Mr. G. L. Seed, slating; Mr. J. Coulston, plumbing; Mr. J. Peake, heating; Mr. J. Crankshaw, terra cotta; Mr. S. Pills, bar-fittings; Messrs. Bruccianni & Co., plaster figures. The decorations are by Mr. Dugan. The total cost is put at 50,000*l*.

BRITANNIA TUBULAR BRIDGE.

SIR,—The Directors of the London and North-Western Railway Company have called my attention to a statement recently circulated in some of the daily papers respecting the condition of the Britannia Tubular Bridge, carrying the railway over the Menai Straits, and more particularly to the discussion at the General Conference of Architects, as published in the *Builder* of the 15th inst. At this Conference Mr. Carroll is reported to have stated with regard to this bridge, that "there was no doubt a process of rusting going on, which must eventually, unless checked, have the effect of making the bridge come down with a crash," and that he "believed tons upon tons of rust were extracted from the Tube every month."

At the same meeting Mr. Skidmore is also stated to have said that he "could testify to the enormous quantity of rust which it yielded."

I can, from an intimate personal knowledge of the structure, most unhesitatingly assert that these statements are utterly without foundation, and, as they are calculated to alarm railway passengers, I, in their interest as well as that of the railway company, publicly challenge the accuracy of the statements which Mr. Carroll and Mr. Skidmore have thought proper to make.

I may add that within the past few years I have, in conjunction with Mr. Ramsbottom, late mechanical engineer to the railway company, most carefully examined this bridge, as well as that over the River Conway, when the ironwork was found practically free from rust, the cells or chambers comprising the top and bottom members of the tubes perfectly clean, and the edges of the plates as sharp as when first placed in position.

These bridges are subjected to a periodical and critical examination by the resident engineer of the district, and I feel confident that, with the care and attention they receive in common with all other structures on this railway, there is no practical limit to their endurance.

WILLIAM BAKER,
Engineer-in-Chief, London and North-Western Railway.

The Congress on Domestic Economy, in connexion with the Society of Arts, will be held at the town-hall, Manchester, on the 26th, 27th, and 28th of June.

ARCHITECTURAL ASSOCIATION.

THE closing meeting of this Association for session 1877-78 was held, as already mentioned, on Friday evening, the 7th inst., in the rooms of the Royal Institute of British Architects, the portion of the proceedings which included the reading of Mr. Roger Smith's and Dr. Phené's papers, and the subsequent discussion, forming part of the General Conference of Architects. Mr. Bowes A. Paice, president of the Association, occupied the chair.

On the motion of Mr. Page, a vote of thanks was accorded to the architect for allowing the members to visit the new vestry-hall at Hampstead on the previous Saturday.

The chairman said he had received a letter from M. Charles Lucas, secretary of the Société Centrale des Architectes, Paris, inviting the Association to send one or two delegates to represent it at the International Congress of Architects to be held at the Palais du Trocadéro, Paris, from Monday, July 29th, to Saturday, August 3rd.

Mr. S. F. Clarkson moved that the president-elect (Mr. H. L. Florence) and Mr. R. Phené Spiers be elected as delegates. The latter gentleman was well known in Paris, and was personally acquainted with most of the leading French architects.

Mr. J. Douglass Mathews seconded the motion, which was agreed to *nem. con.*

Mr. Phené Spiers subsequently stated that M. Lucas, who had been in London attending the General Conference of Architects, had manifested great interest in the Association, and had requested him to explain its mode of working, its classes, &c., to the architects of France. No society conducted on similar principles to those of the Association existed in France.

The thanks of the Association were given to Mr. Paice for the courtesy and assiduity he had displayed in the discharge of his duties as president of the Association during the session.

It was announced that, in order to perpetuate the memory of the late Mr. Edmund Sharpe, M.A., and his connexion with the Association, a committee had been appointed to undertake the publication of the drawings illustrating the last excursion made under his guidance, being that to the district of "Charente" in the South of France. This committee, having carefully gone through the drawings (numbering about 200 specially prepared for photo-lithography), consider they will form a quarto volume similar to Mr. Sharpe's later works on the "Mouldings and Ornamentation of the Transitional Period," "Cistercian Abbeys," &c. The publication will consist of about sixty plates, with descriptive letterpress, and it is proposed to issue the work to subscribers at a guinea and a half each copy. The committee say they feel confident that "the valuable character of this memorial as an architectural work will secure for them the co-operation of the profession generally, in addition to which it will be especially interesting as a recognition of the disinterested services rendered by Mr. Sharpe to the profession for many years, both by his valuable publications and by the various excursions which he originated and successfully carried out for the benefit of architectural students." By the permission of the Council of the Institute, a small selection of the original drawings has been placed in their library for inspection. Mr. John S. Quilter, of 10, Brunswick-square, is the secretary to the committee.

JAPANESE WORK.

Mr. Spiers called attention to some curious Japanese woodwork, &c., brought over by Dr. Dresser, and specimens of which were exhibited on the walls of the Institute meeting-room. Mr. Spiers read a short communication from Dr. Dresser, who, after expressing regret that his duties as a juror at the Paris Exhibition would prevent his attendance, went on to say:—"What I wished to call your attention to was certain pieces of wood lattice-work; carved, lacquered, inlayed, and *cloisonné* panels; metal-hinges, lock-plates, and finger-plates; and other works which appear to me to be of special interest to architects. The lattice-panels are made in many patterns; indeed, in design they are almost infinite, and I submit for your respectful consideration that they be used as ventilating panels in room-doors; as enrichments in cabinets; for both dwarf-blinds in our windows,—replacing the very modern cane-blinds,—and for outside sun-shutters, instead of Venetian shutters. In the latter case they would have a considerable thickness, and be formed of close varieties of lattice-work, so that a very small obliquity of the sun's rays would be necessary in order that shadow be secured. Other panels, which may be said to consist of a simple combination of carved and perforated work, I propose to use in dados, rails, and panelled friezes, by placing them, either in their present state, or when stained black, upon a gold or coloured background,—and in this way they are used in the smoking-room of the Prince of Wales's pavilion which Messrs. Gillow & Co. have arranged in Paris. When the dado rail is made of these carved perforated panels, I think that I should fill the panels of the dado with a kind of plaited bamboo-work, or with inlaid woods of quiet character. The plaited work of which I speak is made in many patterns, and is of the soft yellow colour natural to the bamboo, or is stained to various shades, and it has the advantage that by glue, or other cement, it can be applied closely to a surface without the intervention of any space in which vermin may collect. This material I should also use in the panelled covings of cornices. The carved perforated panels can be made of any size; and inlays of any pattern, from the most minute to the more simple, can be got in pieces either small or large. Panels for the doors of rooms can be had from Japan carved in very low relief, or formed of lacquer work; or a spray in lacquer work may be drawn on a panel which is otherwise of plain unpolished wood. Small doors, such as those used for cabinets, and the fronts of drawers, are to be had with panels of carved ivory, lacquer on ivory, *cloisonné* enamel, iron inlaid with gold or silver, or of fine wood inlays; and I submit for your consideration that wherever work involves the expenditure of a considerable amount of skilled labour, it will be found cheaper to bring the work from Japan. Metal hinges, lock-plates, and finger-plates, can be had formed of iron inlaid with gold and silver, or of wrought-iron only; and finger-plates of porcelain, either blue and white, or of Satsuma character, are also made in Japan. In submitting these suggestions to you, I simply beg that you give the matter your kind consideration. If these importations from Japan would be useful to us, I ask that you kindly assist me in trying to introduce them, for if we, as architects, do not patronise what is good in art as associated with building, the people cannot do so."

Mr. T. Roger Smith then read a paper on "Rude Stone Monuments," which we print elsewhere.

The scrutineers appointed at the commencement of the meeting (Messrs. R. Henry and W. H. A. Belling) reported that they had examined the voting papers, and the following were the officers elected for the Session 1878-79, viz.:—

President.—Mr. H. L. Florence.
Vice-Presidents.—Messrs. Aston Webb and W. L. Spiers.
Committee.—Messrs. S. Flint Clarkson, A. Conder, T. Garratt, E. B. l'Anson, F. G. Knight, W. Hilton Nash, B. A. Paice, A. Payne, W. Scott, and W. H. White.
Treasurer.—Mr. J. Douglass Mathews.
Librarian.—Mr. R. E. Pownall.
Secretaries.—Messrs. E. G. Hayes and R. C. Page.
Solicitor.—Mr. Francis Truefitt.
Assistant Librarians.—Messrs. L. A. Shuffrey and J. W. Stone.
Auditors.—Messrs. T. E. Mundy and F. Hemings.
Registrar.—Mr. Thomas H. Watson.

With this announcement the business of the session terminated.

The annual dinner of the Association was held on Tuesday evening at the Holborn Restaurant, Mr. Bowes A. Paice, the retiring president, in the chair, supported by about sixty members and friends. The usual loyal toasts having been proposed from the chair, and duly honoured,

Mr. Hugh Stannus, in fitting terms, proposed "The Army, Navy, and Reserve Forces," coupled with the name of Captain H. C. Boyes, of the London Rifle Brigade (one of the past presidents of the Association), who responded.

Mr. E. C. Robins, in proposing "The Architectural Association and its late worthy President," remarked that the Association had much upon which to congratulate itself since the old days when its *habitat* was Lyons Inn Hall. He deprecated the retirement from all participation in the work of the Association of many of those senior members of the profession who owed a great deal of their advancement to their connexion with the Association, and congratulated the Association upon having had so courteous and indefatigable a president as Mr. Paice during the past year.

Mr. Paice responded.

Mr. R. Phené Spiers, in proposing "The President-elect, Mr. H. L. Florence," adverted to that gentleman's successful career as a student, he having won the Gold Medal and Travelling Studentship of the Royal Academy, and the Soane Medallion of the Institute.

Mr. Florence, in response, attributed much of his success to the instruction he had received through the work of the Association.

Mr. Bovill proposed "The Treasurer," Mr. J. Douglass Mathews, who, in response, alluded to the possibility that, in consequence of the proposed structural changes to accommodate the Institute in Conduit-street, the Association would have to seek fresh quarters. The relations subsisting between the two bodies were, however, most cordial, and no doubt the Institute would do all in its power to obtain the increased accommodation it required without incommoding the Association. The advantages of the two societies remaining under one roof were obvious.

Mr. Quilter, in proposing "The Honorary Secretaries," spoke of the ability and zeal with which those gentlemen discharged their duties.

Messrs. E. G. Hayes and R. C. Page responded.

Mr. Vinall proposed "The Committee, Librarian, and other Officers," coupled with the name of Mr. S. Flint Clarkson, who replied.

The Chairman, in proposing "The Royal Institute of British Architects," touched upon the subject referred to by Mr. Douglass Mathews, and re-echoed that gentleman's observations. He referred to the courtesy which had been displayed towards the Association by the president of the Institute, Mr. Charles Barry, and congratulated the Institute upon the success of the recent Conference,—a success largely due to the honorary secretaries, Messrs. Arthur Cates and R. Phené Spiers.

Mr. Spiers, whose name was coupled with the toast, responded, endorsing what had been said as to the readiness of the Institute to consider the requirements of the Association. At the same time, he insisted upon the absolute necessity of the Association's maintenance of its own independence.

Mr. Lacy W. Ridge proposed "Prosperity to the Sister Arts," coupled with the names of Messrs. W. Wynfield and J. D. Linton, both of whom returned thanks.

The only other toast was that of "The Visitors," proposed by Mr. E. C. Lee, and coupled with the name of Mr. Thompson, who responded.

The proceedings were enlivened by songs given by Messrs. Dale, Haslehurst, E. C. Lee, Hayes, Riddett, Black, R. P. Spiers, Molyneux, Boyes, Stannus, and Pink.

ENLARGEMENT OF THE LAMBETH CEMETERY AT TOOTING.

THE OPENING CEREMONY.

THE cemetery at Tooting belonging to the parish of Lambeth has just been enlarged, and the ceremony of consecrating the additional ground was performed by the Bishop of Rochester last week. The great increase in the value of land in every suburb around London is shown in the cost which has been incurred in acquiring this addition to the cemetery. The cemetery itself is comparatively modern,* the original area consisting of about 30 acres, which were purchased at a cost of 300*l.* per acre. The expenditure incurred in laying out and draining the ground, and in the erection of chapels, lodges, walls, and fences, amounted to 12,423*l.*, bringing the total cost of the cemetery up to upwards of 21,000*l.* The adjoining land purchased for the extension of the cemetery—11 acres in extent—cost 500*l.* per acre, and it is worthy of remark, as showing the value of land in the locality, that two days after the purchase of the land had been effected by the parochial authorities, 700*l.* per acre was offered for it. The expense of preparing the ground for interments in the cemetery as extended, by the erection of walls, fences, and road-making, has been about 3,300*l.*, the entire cost of the enlargement, including the land, being close upon 9,000*l.* It is stated that the South-Western Railway Company, whose line passes within a short distance of the cemetery, contemplate making a siding from their main line to the cemetery-grounds.

SANITARY IMPROVEMENTS AT ASCOT RACECOURSE.

SINKING AN ARTESIAN WELL.

SEVERAL structural and other improvements have been made at Ascot, where the annual races have been held this week. One of the most prominent of the works on the course is that now in progress, and which will not, for some time to come, be completed. It consists of an artesian well, which is being sunk in the hollow in the centre of the heath. The boring is being carried out by Messrs. S. Baker & Son, of Southwark Bridge-road, a depth of about 50 ft. having already been reached. Iron cylinders, 6 ft. 4 in. in diameter, were sunk at the commencement of the work, but the great influx of surface-water rendered the use of the boring-tool necessary, and it has been ascertained that this laborious operation will have to be continued until the chalk is reached, and a pure supply of spring water obtained. Amongst the other improvements which have been effected on the course is an entrance through which the royal *cortége* comes upon the course, a re-arrangement of the stand for the exclusive use of the members of the royal family, together with a renovation of the grand stand and the stand for the Master of the Buckhounds, all of which have been carried out under the superintendence of Mr. W. Seabrook, her Majesty's Inspector of Palaces.

The Royal Academy. — At a general assembly of the Royal Academy of Arts held on Wednesday evening, Mr. W. F. Yeames, painter, was elected an Academician, and Mr. Frank Holl, painter, and Mr. E. Crofts, painter, were elected Associates.

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* In the *Builder* for 1854 (vol. xii., p. 223), we gave a view of the cemetery and buildings, then in progress, from the designs of Messrs. Wehnert & Ashdown, architects.

"THE GROSVENOR."

THE Middlesex magistrates have wisely reconsidered their refusal to confirm the licence given to the restaurant attached to the Grosvenor Gallery, and have revoked their first splenetic decision. We heartily congratulate Sir Coutts Lindsay on the unanimous expression of goodwill which the refusal on the part of the magistrates evoked, at the same time expressing, for ourselves and the public, our sense of the benefit he has conferred on us by the provision of so fine a set of rooms, and the consequent opportunity for an annual exhibition with a special character of its own, and which we have no doubt will prove a permanent and increasing boon to the artistic world of London.

COMPULSORY PURCHASE OF WATERLOO BRIDGE.

THE arbitration proceedings in regard to the compensation to be paid by the Metropolitan Board of Works to the shareholders of the Waterloo Bridge Company, in respect of the throwing open to the public of this bridge free from toll, under the provisions of the Toll Bridges Act of last Session, were commenced at the offices of the Institution of Surveyors in Great George-street, on the 30th of April. The Bridge Company claimed a sum of 750,000*l.*, and the arbitrators appointed to consider the amount to be awarded, were Captain Douglas Galton, Mr. Nutter, Q.C. (selected by the Bridge Company), and Mr. F. M. White, Q.C. (appointed by the Metropolitan Board of Works).

In the course of the investigation Mr. Galsworthy stated that his valuation of the bridge amounted to 563,361*l.*, and of the arches under the approaches 26,000*l.*, making a total of 589,361*l.*, to which he added 10 per cent. for compulsory purchase, his total valuation being thus roundly 649,000*l.*

We give the evidence of another of the witnesses on the side of the company, as reported in the *Metropolitan* :—

Mr. Edwin Fox said that, inasmuch as the bridge was a substantial structure, that would last for all time in all human probability, and inasmuch as it was situated in the centre of the largest city in the world, and also its permanent character in regard to increase of income, which had declared itself by the experience of more than a century, he looked upon it as a property to be governed by a maximum multiplier upon the rental produced. He had accepted the evidence of the engineer as to the condition of the bridge, and had arrived at the conclusion that the increase of income was likely to be regulated in the future at the same rate as in the past. He calculated that the annual increase in the revenue from the bridge would be 250*l.* In estimating the value of the Waterloo Bridge he deducted the gross expenses of 3,776*l.*, which left an annual income of 18,929*l.* in 1876, which he estimated would be maintained for the next five years. His total valuation of the bridge itself, with its increasing income, was 563,343*l.* In addition there were the arches north and south of the bridge, which he had reckoned as ordinary investments to produce 23,897*l.*, making a total of 587,244*l.*, to which he added ten per cent. for forced sale, making a total of 645,968*l.*; and he also added to this 50,000*l.*, on the ground that at present the bridge and approaches were more extensive than necessary to earn the income. In cross-examination Mr. Fox admitted that, as a whole, his valuation was equal to thirty-five years' purchase, and that this was a higher value than attached to Consols. His estimate was based on the increasing value of the income of the bridge.

Mr. Henry Law, C.E., Sir Joseph Bazalgette, Mr. C. Hutton Gregory, and others, on the part of the Board, gave evidence to the effect that the bridge was in a dangerous state, and that a large expenditure upon it was required.

Mr. Robt. Vigers, surveyor, putting this on one side, said his figures were,—value of bridge tolls, 358,000*l.*; arches on the Middlesex side of the river, 7,095*l.*; ditto on the Surrey side of the river, 11,139*l.*; gas company's rent, 2,100*l.*; making a total of 378,334*l.* Then there was an allowance of ten per cent. for forced sale. He thought twenty years' purchase of the tolls, considering all the circumstances, was a fair price, and he had taken them on that basis because he thought them somewhat analogous to freehold house property.

It is understood that the arbitrators have awarded the company 475,000*l.*

CHESTNUT.

SIR,—A place of worship, built for the French Protestant Refugee Huguenots, about 200 years ago, in Glebe-place, King's-road, Chelsea, is undergoing repair by Mr. Tink, builder. Mr. Lane, his foreman, acquaints me that the inner framework of the roof is chestnut, and that it is of considerable interest. Any of the gentlemen of the architectural profession may see into the building just at the present time during alterations.

SAVILL HAYWARD, Minister.

THE WOMEN'S HOTEL, NEW YORK.

THE Women's Hotel, of which our New York correspondent gave some particulars when it was opened (p. 428, *ante*), is a complete failure, and is to be abandoned immediately. We termed it "an imperfect experiment." If we had known at the time all the regulations that were to be imposed on the occupants we should have spoken of it as a fore-doomed failure. Judge Hilton, who, as executor of the Stewart Estate, has carried out the undertaking, says :—

"You can run a hotel for men exclusively, but for women you can't. They would rather stay at the boarding-houses, and put up with hall bedrooms, poor fare, and skimp furniture, and have the society of gentlemen, than take the luxuries of Stewart without them. It is natural, and you can't blame them. The hotel was meant for ladies who earn their own living, but with all our efforts we could not get more than fifty boarders, and fifteen of these ought not to be there, for they don't earn their living, and are there merely for economy. The accommodations were equal to all that the richest woman in the nation can obtain, but women will not accept any help based on the condition of separation from men, and the free admission of men would have subjected the house to gossip and eventually to scandal."

This may be one reason for the collapse, but there are others; the strictness and unwisdom of some of the regulations, the sort of espionage kept up over the going and coming of the inmates, and the refusal of admission, in the first instance, to three-fourths of the applicants for rooms.

TEWKESBURY.

A NEW Wesleyan Chapel was opened here on the 5th inst. by Dr. Pope, president of the Conference. It is on the site of the old Market-house in the centre of the town, and owing to the narrowness of it, only the front elevation is seen. It is set back 40 ft. from the street, the space thus obtained being laid out as a garden.

The style is Gothic of the fourteenth century, and the elevation consists of a gable containing a five-light window, flanked at the angles by octagonal buttresses, on the top of which are pinnacles springing from carved string-courses. The entrance is in the centre by a porch with coupled columns of blue Pennant stone, with carved and moulded bases. The materials of the front are yellow local stone, with Bath dressings.

The interior is designed to seat 320 on the ground-floor, with 50 more in a gallery above the entrance; no side galleries are contemplated. There is a three-sided chancel lighted by three windows, filled with stained glass subjects from the life of our Lord, executed by Mr. Bourne, of Birmingham, and the gift of Mr. Collins, the builder of the chapel.

The roof of the chapel and chancel is open-timbered, the feet of the principals resting on carved stone corbels. The chancel arch is moulded and has respond shafts of red Mansfield, with carved caps and bases, on which are sculptured figures at prayer and praise. Mr. Martin, of Cheltenham, did the carving. There are quasi-transepts to the chapel, in which there are three windows. The cost is about 3,000*l.*

The architect is Mr. Charles Bell, of London, and the builder Mr. Collins, of Tewkesbury, by whom the partial restoration of the abbey, under the late Sir Gilbert Scott, has been executed.

WANT OF HARBOURS ON THE NORTH-EAST COAST OF SCOTLAND.

THE Commissioners appointed to inquire into the harbours off the coast of Scotland having reported that the harbours off the north-east coast are totally inadequate both for refuge from storms and convenience, the Board of Trade are shortly to devise some extensive schemes to remedy so dangerous a state of maritime matters.

The Treasury, however, have before them an awkward instance of the incapacity of some engineers and builders to erect works to withstand the storms that rage on the Scottish coast. For instance, the country has expended no less a sum than 140,000*l.* to improve the harbour of Wick. Immense boulders of stone braced with clamps of iron, and set in concrete foundation, supposed to be impregnable to the assaults of the wildest storms, were, when nearly finished, swept away like so much matchwood in a few hours, and the masons, when they came to work in the morning, are reported to have fairly cried at the sight before them, for they had prided themselves at being at last successful in building a barrier that would stand for ages as a conquest of man over the sea.

So disheartened has the Government become at the "Wick" experiment as to cause the Treasury to withhold further expenditure in that direction, and if engineers or architects cannot devise some irresistible bulwark, the old-fashioned groynes must again be trusted to. Now, this is a sorry look-out for 200 miles of coast from the Forth to the Orkneys, and as Parliament annually votes only 3,000*l.* for improving the harbours of Scotland, that sum will go but a short way in erecting groynes.

At Peterhead and Fraserburgh, the local authorities are beginning to make some fresh experiments to secure good havens, and aided by the Public Works Loan Commissioners and encouraging reports of scientific builders, it is expected that more satisfactory results will follow than in the Government experiment at Wick.

THE RELATION OF ARTIST AND ARCHITECT.

SIR,—It may throw some light on this vexed question if it be made more generally known that all the great works of Pericles's age were carried out under the direction and supervision of Phidias. The entire host of artists and artist-workmen, of every kind, assembled at Athens were occupied in following out his ideas,—even the weavers and embroiderers of the tapestries which were to form the draperies of the colossal statues of Jupiter, Minerva, &c. If the artist held sovereign sway at the grand climax of Grecian art, it is paralleled by the regality of Michelangelo, and of Raffaelle at the culmination of the great Italian epoch. It cannot for one moment be doubted that that artist who is supreme in his mastery over the human figure must be king of arts.

The most promising sign of the art-times is the fact that architects now recognise the fact that the students of the sister arts must, in the beginning of their career, pursue the same curriculum of study, and that the study of the specialities of the three arts should not be entered upon till that preliminary course has been satisfactorily passed; they recognise the fact that architects must be artists.

The following studies ought, in the primary course, to be common to the three professions :—1. The science of proportion. 2. Anatomy. 3. Perspective. 4. Drawing and modelling ornament. 5. Drawing and modelling the figure. Second Course, Specialities : — *Painter.* — The science of colour; painting. *Sculptor.*—Carving in marble; bronze casting. *Architect.*—The science of colour; the principles of construction; masonry; carpentry, &c.

The Germans who strove to observe the order and manner of working which was pursued in the palmy days of Italian art, designed their buildings with reference to the mural decorations, for these would be the fullest exponents of the building's purpose. One has only to glance at the dismantled Parthenon to be convinced that architecture is the setting of painting and sculpture.

In Munich, commissions were given to the mural painters and to the sculptors several years before the edifices were commenced. The painters and sculptors were, therefore, prepared to proceed with their work when the carcass was finished. A scaffolding which could easily be ascended by inclined planes, and worked upon without the least trepidation, was always prepared for the fresco painters. W. C. T.

ASPHALTE AND HORSES.

SIR,—In reply to Mr. Evans's rather amusing way of advertising himself in connexion with asphalte paving, allow me to call his attention to the following extract from the Paris letter of the *City Press* :—

"Regarding the city itself as an exhibition no less interesting than that now open on the Champ de Mars, the student of municipal law and local administration may profitably make note of a few things. Here is a city of groves and palaces truly; but it is also a city of asphalte. But on a 'greasy' day the streets of Paris are not strewn with prostrate horses as the streets of London are, very much, indeed, we think, to our own disgrace. A little party of social, sincere reformers have been perambulating the streets of Paris lately, and they found that in the course of fifteen days, some five of which were rainy, they did not see a single horse down or any interruption of the traffic through the treachery of asphalte. It is the seasonable scattering of sand that makes all the difference, although mere water in plenty will render asphalte as safe in wet as in dry weather, as the *City Press* has often urged, pointing in support of the proposition to the safety of horses on asphalte during heavy rain."

J. E.

DISTRICT SURVEYORS' FEES.

SIR,—Knowing how desirous you are to see questions from different points of view, will you allow me, *àpropos* of Mr. Walker's letter inserted in your columns recently, to make a simple statement?

Some short time since I carried out some works under three different contracts, for which three different notices were sent to the district surveyor. The contracts amounted to 45,000*l.*, and the fees charged amounted to 112*l.* 7s. 6d. The surveyor himself visited the works about six times, and his representatives about twelve times, therefore each visit would be paid for at the rate of 15*l.* 15s. and 1*l.* 10s. respectively.

Surely Mr. Walker's lines have not fallen to him in pleasant places. W. S. JOSOLYNE.

*** We insert our correspondent's letter, and have no doubt the district surveyor will be able to show special reasons for the charges.

SIR,—I have read with some interest the communication of Mr. Robert Walker in your issue of the 1st inst. I have no doubt that Mr. Walker is most anxious to do his duty, and that for the responsibility imposed upon him he is very inadequately remunerated. Every right-minded person must deeply sympathise with him in the matter of the accident in the Haymarket, which those who know him are quite aware he deplores most keenly.

I wish, however, to say one word on behalf of the general public. At present, any one who desires to build or improve may have to consult not only the district surveyor, but the police authorities and the authorities at the Metropolitan Board of Works. The present system is intolerable. For myself, I strongly advocate clothing the Metropolitan Board of Works with adequate authority to deal with all matters in regard to improvements and dangerous structures. At present, the wretched builder is in the position of a wrestler with the Siamese twins. When he has Chang down, then Ising comes on. Those who have had to do business with Mr. Vulliamy and the officers of the Metropolitan Board of Works invariably meet with courtesy and all the assistance that the authorities in Spring-gardens can render,—which, I am sorry to say, is very little. Let any one walk round the parish of St. Martin's-in-the-Fields, and the fact is obvious that Mr. Robert Walker ought not only to be better paid, but ought to have some one at hand to aid him in his onerous duties.

FRED. JAS. TOMKINS.

CASES UNDER METROPOLITAN BUILDING ACT.

RAISING CHIMNEY SHAFTS.

ON Friday, the 7th inst., Mr. Jarvis, district surveyor of Camberwell, summoned Mr. Lacy, builder, before the magistrate at Lambeth Police-court for having raised the chimney-shafts to a house, Talfourd-road, Peckham, to a height beyond that allowed by the Building Act.

The builder made no defence, but promised to amend the irregularity. The magistrate accordingly adjourned the case for ten days, to give the builder the opportunity of complying with the Act.

FIREPROOFING DEALS.

SIR,—Will any of your correspondents afford me information in respect of a process for rendering ordinary deal boarding non-inflammable?

The process should be simple and capable of application without special plant, and be, as to material, tolerably inexpensive. I have thought whether alumina dissolved in sulphuric acid, and diluted down to a strength at which it would just "singe," and not char the boards, would do?

B. P. B.

THE BEAN-FEAST BORE.

SIR,—Applications for contributions towards "bean-feasts," "outings," &c. have once more commenced to flow in; may I venture, therefore, to appeal through your columns to builders to put a stop to this heavy tax upon merchants? I believe very few respectable builders now countenance it, but still it is necessary to forbid lists of firms being issued, to prevent the annoyance.

MERCHANT.

Hastings Baths.—Sir: Permit me to say that the three important glazed roofs for this building were designed, in conjunction with the architects, by Mr. Archibald D. Dawnay, C.E., of London, and he was afterwards entrusted with their construction and erection.—A. TWYMAN.

REBUILDING "THE COTTAGE" AT VIRGINIA WATER.

VISITORS to Virginia Water, who at present are numerous, will have noticed the handsome new building which has just been erected in the place of the old tea-rooms, or, as they were better known, "The Cottage," which has disappeared. The new building has not been erected exactly on the site of the structure which it replaces. The latter was close to the fishing-temple, but the new building has been erected upon a more elevated site, selected by Prince Christian, the ranger of Windsor Great Park, and faces the middle of the lake, from which there is a charming prospect. The building has been erected under the direct supervision of Mr. R. Howe, clerk of the works at Windsor Castle, who met with considerable difficulty in obtaining a good foundation, owing to the marshy nature of the ground. Eventually, however, this was overcome, by the site being covered over with concrete to a depth of 18 in., upon which the superstructure has been built, the walls being of brick, with Bath stone dressings. The staircase is of polished pitch-pine, and the front and garden entrance-doors are of oak. It is stated that the old cottage which has been demolished was more than 150 years old, having been built, as stated, in the early part of the eighteenth century. A spring on the hill at the rear of the building supplies "The Cottage" with water.

Books Received.

The Practical Dictionary of Mechanics. By E. H. KNIGHT. Illustrated. London, and Cambridge, Massachusetts: Cassell, Petter, & Galpin. No date.

EIGHT lines of original preface introduce Knight's mechanical dictionary as an American work, which appears to have been merely reprinted by Messrs. Cassell, Petter, & Galpin. By leaving the reader to form his own conclusions on this point, the value of the book has been rendered more doubtful than would otherwise have been the case. Peculiarities of spelling which have been adopted on the other side of the Atlantic are distasteful to English scholars; and when printed in London without comment or remark are not unlikely to be set down to simple ignorance. But above all things, injustice is done both to the purchaser and to the author of the work by the omission of the date. It is lamentable to see the spread of this slovenly and worse than slovenly habit. The value of a book, map, or other publication, if undated, is materially diminished. The plan was introduced for purposes foreign to the well-being of literature. Its origin was probably the desire to continue the sale of old maps, or books of reference after their interest had been superseded by new discoveries. Such a method, applied to a map, simply destroys its reliability. A dated map, if good in other respects, can never lose its value as the record of the state of geographers' knowledge of the country it represents, at the time of publication. For all historical inquiry this kind of knowledge is essential. Remove the date, and nothing remains but a map which at some unknown time may have been as explicit as the circumstances of the case allowed, but which, as that time is lost, is little more than waste paper.

The same remark applies to all cyclopædias and scientific works. An old book may be of quite as much value to the student, for many purposes, as a new one. For some purposes the value of the old one, so that the date be known, is indeed far higher. Publishers who omit this essential element of the respectability of their works should be fully warned of the consequences. We much regret to see that a literary journal has lately adopted the most objectionable,—not to say scarcely honest,—method of omitting the date on the title of the books which it reviews.

In the present case it is the more unpardonable that the date should be omitted, from the fact that the information contained is brought down fully and fairly to the present time of writing, namely, the first half of the year 1878. Not only, for example, is a very full and excellent account given of the telephone, and of the knowledge attained of the nature of the vibrations which are sensible to the human ear as sound, but we actually find "Microphone, an instrument for increasing the intensity of low sounds by communicating their vibrations to a more sonorous body, which emits a more audible sound."

This admirable definition of a word new to science leads to the remark that Mr. Knight has not done justice to a work of extraordinary research and great literary, as well as scientific, ability, by the title he has chosen. The phrase "practical dictionary" is, in itself, somewhat of a misnomer. All dictionaries are intended for practice. The volume under notice is, in truth, a repertory of mechanical invention. As such it is a work of great merit and great utility. As a dictionary it is by no means what is required by the student. A dictionary means a book which gives information as to words. A dictionary of mechanics should be a book which would contain such clear definitions of all words used by mechanists, or mechanics, as to enable any one to understand any book written on mechanical subjects, or to make proper use of technical terms. As such, the example we have given before of the definition of the word "microphone" is admirable, and would be very hard to improve. An equally good explanation is given of "phonograph," while under the equivalent name of "phonautograph," a duplicate article enters into much fuller detail. Under "Telephone" nearly ten columns of information, interspersed with numerous cuts, are given, citing works published as late as 1876, and giving an admirable *resumé* of discoveries up to that date. This is a fair instance of the fidelity and intelligence with which Mr. Knight has brought together an immense body of detailed information, and constructed a mechanical cyclopædia which is an honour to the press of the United States.

But if we regard the work as a dictionary, we must comment on the absence of scientific, as distinguished from purely mechanical, words, even when the right understanding of these words lies at the very threshold of mechanical study. Thus, if we look for the word "heat," we find definitions of that term as it is used by the smith, and also of latent and specific heat. But of heat as a mode of motion, or an equivalent of mechanical power, not a word occurs under the head. Again, "light" is defined as (1) an illuminating body; (2) a nautical signal; (3) an opening in a vessel; or (4) a pane of glass. As to "light," in physics, nothing is said; nor do we find under this head,—under "colour," "spectrum," or "vibration,"—any notice of the refrangibility of the different rays of light, or of the laws of vibration of light or of sound. The word "refrangibility" does not occur in the dictionary. No doubt the writer had the intention to draw the line somewhere between the theory and the practice of mechanics. This, however, is a great mistake. At all events, the preface should have clearly stated the principle on which the work was constructed. If it falls into the hands of the self-teaching student, he will miss the very guiding principles necessary to pilot him through the intricacies of innumerable details.

With the exception of these faults, the suppression of the date, the description of a cyclopædia as a dictionary, and the omission of the purely scientific element, Mr. Knight's volume is one of unusual merit. It is without precedent in our experience that a writer should collect such varied, detailed, and recent information, and present it with such literary ability and due discrimination of the relative importance of the quotations and abstracts made, as is evinced by the different sizes of type employed. The woodcuts, moreover, are for the most part admirable, and will be new to the English reader. We wish to call the attention of authors and publishers on this side the Atlantic to the great superiority of the American mechanical draughtsmanship as compared to our own. To avoid any invidious comparison with the work of any recent English author, we will refer to a scientific work in which questions of expense cannot be supposed to have been allowed to lower the character of the illustrations. Such is the case, for instance, with the Transactions of the Institution of Naval Architects. We recommend any one who wishes to know what mechanical drawings usually are, and what they may be made, to compare the full-sized plates in that volume with the drawing of Westinghouse's atmospheric brake for railway cars, on p. 356 of Mr. Knight's book, or that of Krupp's 1,200-pounder breech-loading rifled gun at p. 448. The Americans have introduced a mode of ruling mechanical drawings which, combined with great clearness and firmness of outline,

makes them more intelligible representations of machines than is the case with our usual mode of delineation. Even in the smaller cuts, the beauty of the ruling is generally marked. Take as an example the representation of steam-pistons, with different modes of packing (figure 3,759), where perfect clearness is introduced into very minute figures, by the excellence of the ruling.

It is, of course, impossible for a reviewer to read a work of 2,831 pages, containing 7,395 illustrations in the text. And to attempt to indicate all the *lacunæ* in such a work would be to claim an encyclopædic knowledge which is,—to say the least of it,—out of fashion. We may, however, note that it is extraordinary to miss such a word as "meta-centre," which is just one of those for which a technical dictionary is required. In attributing the invention of the tube-well to an American, some injustice is done to a simpler, and we believe much earlier, form of the appliance in this country. Under "printing" and "printing-machines" we miss any reference to that beautiful improvement in the process of composition which was introduced by a Polish inventor, and consisted in marking the letter at the back as well as on the face of each type. In any future edition of the Dictionary of Mechanics we hope, too, due notice will be given of this logotype method.

Under the head "Atmospheric Railway" we find the usual error, to the effect that the failure of that method of propulsion was due to mechanical difficulties. The cause lay very much deeper. It was physical, and, therefore, insuperable. It depended on the rapid influx of terrestrial heat into the exhausted tube, which at once raised the tension of the rarified air. Thus the steam-engines on the South Devon Railway were actually at work pumping out the heat of the earth; and nearly red hot they became in consequence.

The extraordinary inventive power of the Americans is, it may almost be said, the chief motive of the book. We fail to notice under "Drill," or even under "Dentist's Drill," a most beautiful machine of that description, which we saw in the hands of one of the most eminent London dentists six or eight years ago; and in which the use of concentric coils of wire enabled the operator to combine the rapidity of mechanical movement, with the accuracy of a hand instrument. This was an American tool.

It will be seen that there is room—no doubt, ample room—for additions and improvements to this work. But as it is, it goes far to fill an enormous gap in our literature, and is a book for which no small amount of gratitude is due to the industrious and able author.

Miscellanea.

Fall of Platform at Liverpool.—A very startling accident, though unattended with fatal consequences, occurred at the Philharmonic Hall, Liverpool, on Tuesday night, when nearly 800 children fell through a temporary platform. It had been announced for the past week that a "grand concert by 1,000 children, selected from the Liverpool Day Schools, assisted by a powerful choir of adults," would be given in the hall that evening, the entertainment being in aid of the Teachers' Orphanage and Benevolent Fund. For the accommodation of such a large number of children a temporary wooden platform had to be erected on the top of the permanent orchestra. A few minutes before seven o'clock the children, numbering about 800, had taken their places upon the platform in readiness for the commencement of the entertainment. The doors were about to be thrown open to the public when the accident intervened and prevented the proposed concert taking place. Without the slightest warning several of the supports at the lower part of the platform broke, and the whole constructon gave way, the children *en masse* being carried along with it. When some degree of order had been restored, it was found that none of them had been seriously injured, and from the nature of the disaster it is almost a miracle that so many escaped without loss of life or limb. The platform consisted of twenty-four tiers of seats, made of American white pine, 1 in. thick by 9 in. breadth. The seats rested on eight bearers running from top to bottom; while the principal supports, screwed into the orchestra, were not more than 1 in. thick. The weakness of the platform evidently lay in these supports. Who supervised?

The Artisans' Dwellings Act.—The arbitrations under the Artisans and Labourers' Dwellings Act, 1875 (Golden-lane and Petticoat-lane schemes), have been proceeding during the past two or three weeks at Guildhall, before Sir Henry Hunt, C.B. The arbitrator in a Garter-court case fixed the value of the freehold at 2,875*l.* Mr. Curtis and others claimed 5,300*l.* Mr. Clark appeared for the claimants, and Mr. White for the Commissioners of Sewers. Mr. Clark said the freehold extended from 3 to 19, Garter-court, and had been let on a building lease for the term of sixty years from December, 1876, at a ground-rent of 125*l.* a year, to Mr. Yeo for building purposes. There was a covenant in the lease that the land had to be covered by 1879. The reversionary interest of the freeholder after 58½ years had also to be taken into consideration. Mr. Stephen Hickson, land surveyor and valuer, was examined by Mr. Clark in reference to the value of the land. He stated that the building area in question was 3,640 superficial feet; he considered the value of the land to be 1s. 9d. per foot, which included old material, which represented 358*l.* 10s. per annum. If the calculation was made on a twenty-five years' purchase, the land was worth 7,962*l.* The interest of the lessee was worth 3,121*l.* He valued the premises at 4,891*l.* 10s., to which had to be added 10 per cent. for compulsory sale, making a total of 5,021*l.* 10s. The arbitrator pointed out that he could not entertain the proposal for adding 10 per cent. The Legislature had so determined.

Working Men's Club and Institute Union.—The report presented at the annual meeting, held in the Jerusalem Chamber, Westminster, on June 3rd, and just now published, states that the council have been obliged to suspend the publication of their "Journal," for want of adequate funds. In other respects their operations and the extension of their work have been curtailed for the same reason. From the uncertainty and variableness of the income they are often placed in a position of much embarrassment and anxiety. Opportunities of taking up fresh branches of work have either to be abandoned, or, if pursued, it is under the fear that a sudden diminution of receipts may perhaps make it difficult to carry on even the current work of the society. The council make an earnest appeal to those who appreciate the importance of the object in view to help this society to persevere in its useful course. The balance-sheet is made up to March 30th last, and at that date the liabilities of the society amounted to 234*l.* 12s. 10d. Its financial condition has never been so unsatisfactory at any previous period.

The Way of all Theatres.—The Theatre Royal, Plymouth, was entirely destroyed by fire on Thursday night, the 13th. The performance was over, and the theatre closed shortly before 11 p.m. on Thursday. A few minutes afterwards smoke was observed to be issuing from the building by the lessee's son, Mr. Albert Newcombe, who was passing at the time, and who at once raised an alarm, having in the meantime seen flames at the upper windows. The fire-engines were on the spot in a few minutes, but notwithstanding their promptitude and the mass of water that was poured on the building, the fire had in the short time gained such a hold on the premises that they were entirely destroyed at 1.30 a.m., when the roof fell in, leaving nothing remaining but four bare walls. The Lands Committee of the Town Council of Plymouth, to whom the theatre belongs, have commissioned Mr. C. J. Phipps to prepare plans for the rebuilding, and the works are to be completed by Christmas.

The Fine Arts Jury, Paris Exhibition.—The jury of the Fine Arts group have elected their officers. They are as follow:—Bureau of the group: — President, M. Tullo Massarani (Italy); first vice-president, M. Meissonnier (France); second vice-president, M. Gude (Sweden and Norway). First section (paintings in oil and drawings)—President, Mr. Frederick Leighton (England); vice-president, M. Robert Fleury (France). Second section (sculptures and engravings on medallions) — President, M. Cavalier (France); vice-president, M. Fraikin (Belgium). Third section (architecture)—President (M. H. von Ferstel (Austria-Hungary); vice-president, M. Lefuel (France). Fourth section (engraving and lithography)—President, M. Henriquet Dupont (France); vice-president, M. Burgers (Holland). The visits of the jury to the Exhibition have commenced.

"Les Beaux Arts."—Under this title Mrs. C. J. Freake has written a *comedietta en deux actes*, which has been represented with great success at Cromwell House, in the presence of a large and critical audience. The principal parts were sustained with admirable efficiency by Lady Sebright (*Protectrice des Beaux Arts*), Miss Louise Swift (*Femme de Chambre*), Mr. Cotswold Dick (*Poëte des Dames*), and Mr. Charles Colnaghi (*Chef d'Orchestra*). As to Miss Swift, her little maid on the stage was as good as her big dogs on canvas. It was so true to nature that the art in it was forgotten. It says something for the versatility of the esteemed author of the play when we add, that the music too of some of the songs was composed by her.

Overcrowding.—A weekly paper says,—"How many know how the inhabitants of Holborn Buildings live, and how few suspect that Blind Conn inhabits one of the houses, which he sublets in a manner that should startle all sanitary reformers? One room is partitioned off into four compartments, each of which can be had furnished (?) at 1s. a night. Between 70*l.* and 80*l.* a year for a single chamber in a Holborn slum! It is enough to make an ordinary lodging-house keeper's mouth water. All Mr. Conn's lodgers use the same kitchen and other domestic conveniences with a disregard for privacy and decency that would shame a Zulu Caffre."

Certainty as to Posting.—A pamphlet has been issued by Mr. A. Clifford-Eskell (Simpkin, Marshall, & Co.), upon "Booked Letter Receipts," and their uses, advantages, and reasons for adoption. The matter contained is worth reading, and the fact that the Post-Office authorities have already decided to try the experiment of issuing, at a charge of ½d., certificates of letters, newspapers, or book packets received at four of the leading provincial towns indicates the importance they attach to the proposed plan. We cannot, however, bring ourselves to think that the plan would be adopted to any very large extent by the public.

Rattening.—Two cases of rattening have occurred at Rotherham. Two builders named Darlow and Stephenson have large brickyards, and recently they discontinued employing unionists. Early in the morning their yards were visited by a number of men, who destroyed everything they could lay their hands upon. Over 30,000 bricks were trampled upon and rendered useless; steam and water-gauges were broken, and four wheelbarrows placed on burning kilns. No damage was committed at a neighbouring yard, the owner of which employs union men.

Midland Counties Art Museum, Nottingham Castle.—The guests invited to meet the Prince and Princess of Wales at luncheon on the 3rd of July next, on the occasion of opening the Museum, have been informed that the luncheon will not take place, in consequence of the lamentable death of the Mayor of Nottingham. This gentleman, Mr. Alderman Ward, who had assiduously promoted the Castle Museum Scheme, fell from his horse a few days ago and fractured his skull. On the eve of the fulfilment of his hopes he was removed.

Society of Arts' Conversazione. — The council and members of the Society of Arts gave a *conversazione* on Wednesday evening last at the South Kensington Museum. The guests were received by the council in the Architectural Court, where the audience chamber of the Palace of Akbar Khan at Fathpur Sikri, near Agra, with its remarkably carved central throne pillar, formed a wonderful reception-room.

Honours.—The riband of the Legion of Honour has been given to most of the architects, engineers, and contractors engaged on the Paris Exhibition buildings in the Champ de Mars and at the Trocadéro.

The Foreign Cattle Market —The markets committee have delivered into the Court of Common Council a report for authority to expend 7,000*l.* in the execution of works required at the foreign cattle market, Deptford.

TENDERS

For the erection of three cottages and one shop at Fores Gate, for Mr. Boswell. Mr. C. R. Peters, architect:—

Steer & Acock	£1,578 0 0
Tillett	1,490 0 0
Walker	1,200 0 0
Charlton	1,183 10 0
Webb	1,175 0 0
Warrilow	1,155 0 0
Weston (accepted)	1,100 0 0

For Kensington Vestry-hall and Offices. Mr. Robert Walker, architect:—

		Less for Alternative Main Roof.	Add for Wainscot to Entrance-hall.
Wall, Brothers	£30,158	£639	£54
Dove, Brothers	25,440	570	125
Trollope & Sons	25,294	568	156
Thorn	25,245	600	160
Brass	24,982	518	135
Stimpson & Co.	24,978	521	141
Sewell & Son	24,851	503	136
Adamson	24,600	568	126
Chappell	24,364	537	118
Lucas & Son	24,275	558	130
Ashby, Brothers	24,200	500	200
Macey & Son	23,975	555	136
Conder	23,889	512	200
Braid & Co.	23,850	562	143

For rebuilding Horstead Church, Norfolk, exclusive of tower. Mr. R. M. Phipson, architect:—

	Church.	Chancel.
Downing	£2,146	£471
Chapman	2,010	546
Baldwin	1,866	453
Durrant & Evans	1,687	435
Cornish & Gaymer*	1,496	440

* Accepted.

For the restoration and benching of the nave and aisles of Wingfield Church, Suffolk. Mr. R. M. Phipson, architect:—

Cornish & Gaymer	£1,150	0	0
Holsworth	1,060	0	0
Calver	1,051	0	0
Grimwood	970	0	0

For the restoration of Rushall Church, Norfolk. Mr. R. M. Phipson, architect:—

	Church.	Chancel.
Cornish & Gaymer	£1,175	£423
Hawes	916	400
Wells & Ludkins	852	350
Grimwood (accepted)	864	330

For building a new bridge at Wortwell, Norfolk. Mr. R. M. Phipson, architect:—

Grimwood (accepted)	£1,043	0	0

For gas fittings, Norwich City Lunatic Asylum. Mr. R. M. Phipson, architect:—

Palmer	£828	10	0
Cornish & Gaymer	800	0	0
Land & Co.	795	0	0
Bank (accepted)	750	0	0

For the restoration of Ringshall Church, Suffolk. Mr. R. M. Phipson, architect:—

Crowe	£1,089	0	0
Cornish & Gaymer	1,050	0	0
Grimwood	825	0	0
Tooley (accepted)	750	0	0

For a new mission-room in connexion with St. Matthew's Church, Marlborough-road, Chelsea. Mr. John T. Lee, architect. Quantities by Mr. W. Thornicraft:—

Jones & Davies	£1,073	10	0
Lawrence	1,058	10	0
Brass	1,038	19	0
Tongue	1,015	18	11

For two houses in the St. Alban's-road, Watford, for Mr. Clement Heaton. Mr. John T. Lee, architect. Quantities by Mr. W. Thornicraft:—

Turner	£2,456	0	0
Axford	2,411	0	0
Clifford & Gough	1,977	0	0
Chadwick	1,778	0	0

For a house in the Hanworth-road, Hounslow, for Mr. J. O. Carter. Mr. John T. Lee, architect. Quantities by Mr. W. Thornicraft:—

Smeed	£1,180	0	0
Beauchamp	1,039	0	0
Brunsden	1,015	0	0
Hiscock	931	0	0

For additions to No. 82, Chalk Farm-road, for Mr. G. J. Smith. Mr. J. R. Furniss, architect:—

R. White (accepted)	£1,196	0	0

For house, shop, bake-house, oven, &c., at Shere, Surrey, for Mr. Sherman. Exclusive of bricks, tiles, and sand. Mr. Dibble, architect:—

Heselgrave	£442	0	0
Miles	427	0	0
Hamblin, Brothers	425	0	0
English	385	0	6
Edser (accepted)	369	0	0

For house, Horsham-road, Dorking, for Mr. Strong. Exclusive of masonry, plumbing, glazing, and painting. Mr. Dibble, architect:—

Bricklayer's, Slater's, and Plasterer's Work.

Edser	£445	0	0
Heselgrave	374	0	0
Clear jun. (accepted)	320	0	0

Carpenter's, Joiner's, and Smith's Work, including Bellhanging.

Canter	£316	0	0
English (accepted)	254	0	0
Grinstead	224	0	0

For house and stables for Mr. T. T. Fox, Farnborough, Kent. Messrs. Ernest George & Peto, architects. Quantities by Messrs. Stoner & Sons:—

Payne & Balding (accepted)	£5,612	0	0

For four cottages on Chislehurst Common, for Mr. C. Morley. Messrs. Ernest George & Peto, architects. Quantities by Messrs. Stoner & Sons:—

Wright	£2,080	0	0
Otway	1,750	0	0
Arnaud	1,634	0	0
Payne & Balding (accepted)	1,598	0	0

For house in Elmfield-road, Bromley, Kent, for Mr. J. Bourne. Mr. W. R. Mallett, architect:—

Arnaud	£2,197	0	0
Grubb	2,042	0	0
Payne & Balding (accepted)	2,018	0	0

For new farm buildings at Aikton, for Mr. D. Bragg. Messrs. Hetherington & Oliver, architects:—

H. & R. Court (accepted)	£562	0	0

For additions to stables, &c., at Sundridge Park, Bromley, Kent, for Mr. E. H. Scott. Mr. J. M. Anderson, architect:—

Payne & Balding (accepted)	£2,382	0	0

For house at Derry Down, St. Mary Cray, Kent, for Mr. Pollard. Mr. G. St. Pierre Harris, architect:—

Dunn	£945	0	0
Payne & Balding	875	0	0
Tredwell	786	0	0
Winter	765	0	0
Wright (accepted)	722	0	0

Accepted for building a new house at Arthur-street, Penrith. Messrs. Hetherington & Oliver, architects:—

Campbell (mason, &c.)	£554	12	0
Pattinson (joiner)	242	14	9
Porter & Dixon (plumbers, plasterers, and painters)	197	10	1
Barton (slater)	52	0	0

For erecting a house for Dr. C. E. Collins, East Grinstead. Mr. T. Taylor Smith, architect:—

Charlwood & Beard	£1,232	14	0
Markin & Quickenden	1,169	0	0
Charlwood, Brothers	1,153	5	0
Steer	1,110	7	9
Godley	1,015	0	0

For additions to residence, near Ringwood, Hants, for Mr. H. T. Armitage. Messrs. Lee, Brothers, & Pain, architects:—

Witt & Alexander	£4,200	0	0
Hammerton, Bros., & Vine	3,655	0	0
McWilliam	3,653	0	0
Hoard, Bros., & Walden	3,486	0	0
Sibley	3,439	0	0
Jenkins & Son	3,405	0	0
George	3,350	0	0
Crook	3,177	0	0

For the erection of proposed residence, at Wimbledon, for Mr. A. A. Ranken. Mr. J. Tolley, architect. Quantities by Mr. W. F. Meakin:—

Nightingale	£4,483	0	0
Shaw	4,344	0	0
Faulkner	4,135	0	0
King & Son	4,125	0	0
Macey	4,060	0	0
Marriage	4,000	0	0
Ward & Son (accepted)	3,715	0	0

For the erection of blocks of cottages for the Dulwich Cottage Company, Limited. Mr. E. J. Tarver, architect. Quantities by Mr. G. E. Bagg:—

Ward (accepted).

For the erection of new banking premises, Bank-street, Carlisle, for the Clydesdale Banking Company. Messrs. Hetherington & Oliver, architects. Quantities by Mr. Croweroft:—

	In Local Red Stone.	In Corncockle Red Stone.
Hill & Beaty	£9,725 17 10	£9,776 17 10
Sproat, Bros	7,622 16 8	7,867 12 8
Irving	7,566 17 1	—
Metcalfe	—	7,530 10 0
Warburton	7,104 0 0	7,304 0 0
Milburn	6,760 14 0	7,015 14 0
Beaty, Bros.	6,759 8 7	6,919 8 7
Forrest	6,648 3 10	6,748 3 10
Court	6,591 10 0	6,747 10 0
Armstrong*	6,275 13 0	6,418 9 0
Latimer	6,262 19 6	6,354 6 6
Batey & Forster	6,194 0 0	6,284 0 0
Beattie & Co.	6,193 0 3	6,284 16 3

* Accepted in local red stone.

Sutton Bridge Schools.—The estimate of the architect, Mr. J. D. Dawson, was erroneously included in the list of tenders sent to us.

TO CORRESPONDENTS.

J. B.—L.—C. S.—C. L.—S. H.—J. J. R.—A. & B.—R. P.—F. R.—A. J. M.—H. & O.—P. & B.—A. T.—L. M.—J. M.—J. H. & Son.—J. J. & Co.—R. T. S.—C. F.—J. L.—H. B.—T. E.—C. J. P.—T. B.—T. N.—F. S. B.—C. A. G.—F. J. D.—Professor L.—S. R.—Mr. F. A. Evans.—Several persons have sent their cards for our correspondent (*re* "Asphalte"), but we must decline interference.—G. C. & Co. (pamphlet has not reached us).—C. R. C. (next week).—W. C. (next week).—J. E. E. (next week).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

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